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# THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW
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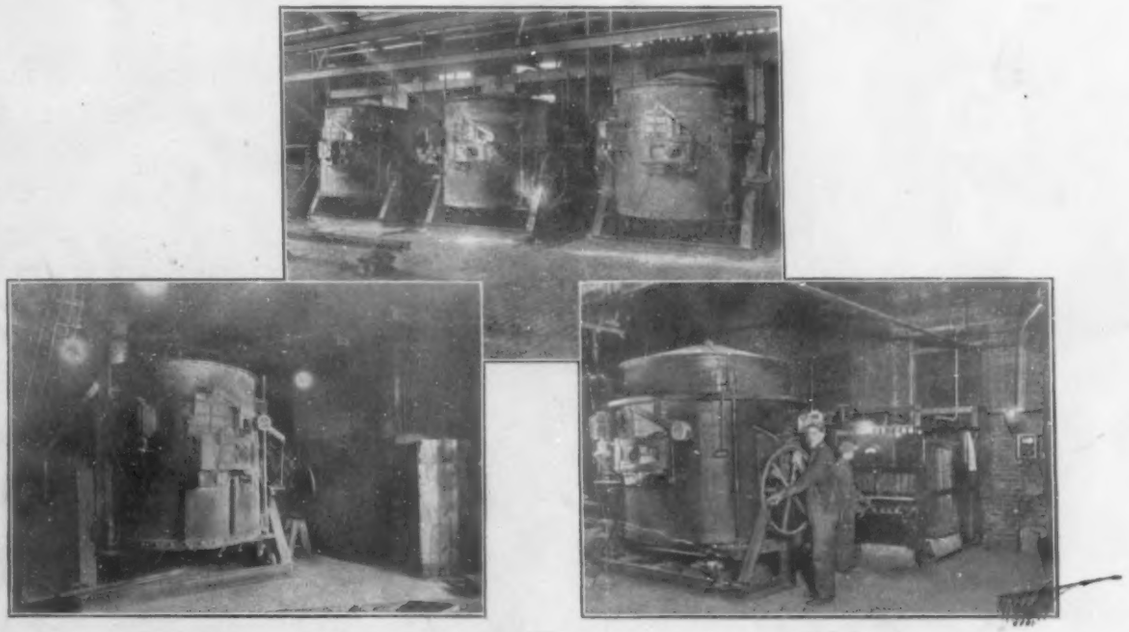
A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES


## BAILY ELECTRIC FURNACES IN DETROIT



(1) The Penberthy Injector Company, a Detroit Brass foundry, for Steam, Water, and Gas Goods. (2) The McRae Roberts Company, a Detroit foundry for special brass products. (3) The Michigan Smelting & Refining Company, a Detroit smelter that has five Baily Electric Furnaces.

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CONTENTS, PAGE 179 DIRECTORIES, PAGE 76 WANT ADS, PAGE 86 INDEX TO ADVERTISEMENTS, PAGE 97

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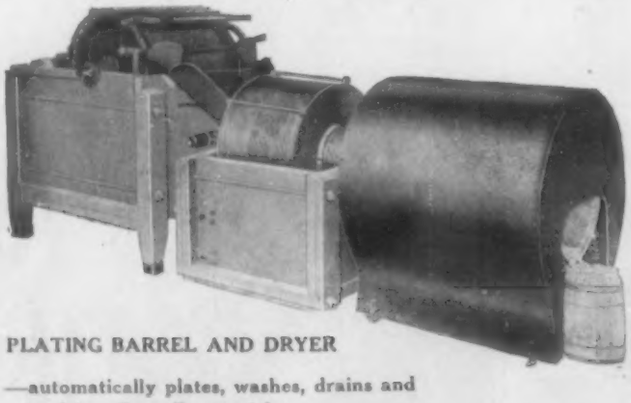

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THE METAL INDUSTRY
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THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW

Vol. 17 NEW YORK, APRIL, 1919 No. 4

# METALLURGICAL FURNACES.

AN ARTICLE DEALING WITH THE CONDITIONS THAT GOVERN SIZE, SHAPE AND TYPE OF METAL MELTING FURNACES.

WRITTEN FOR THE METAL INDUSTRY BY ADOLPH BREGMAN, METALLURGICAL ENGINEER.

Probably the most inexact branch of engineering science is that of furnaces. Although fire was one of man's earliest achievements, it has never been brought to the pitch of accuracy that mechanics and chemistry have. This is due in the main to two things. First, the difficulties are much greater. One cannot stop a furnace in mid-heat to find out what has happened inside. Taking samples at various stages, or in different parts of the furnace is always hard and often impossible. Second, heat can be produced, fortunately or unfortunately, by inefficient methods which will get results of a sort. To be sure, too much fuel is used, heat is wasted, time and labor are lost, but the job is done after a fashion.

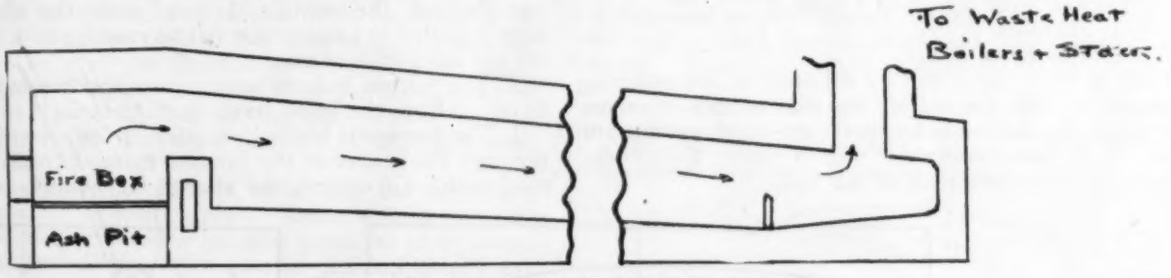



FIG. 1—ORE SMELTING REVERBERATING FURNACE.

A furnace is primarily a mechanism for the generation and application of heat to an object in order to make some desired change in its composition, form or temperature. In other words, if we have an object which is unsatisfactory in any particular we may have to apply heat to it, in order to correct it. The problem, therefore, immediately presents certain definite demands which the furnace must meet in order to do satisfactory work. Given the material which is to be treated, before it is possible to design or choose a furnace for it, one general question must be answered.

What is the purpose of applying heat to this material, that is, what is the desired product?

When this question is answered some of the details can be taken up.

1. Is the material to be heated above its melting point or to remain in its original form?
2. What is the required temperature?
3. Is this temperature to be maintained throughout the furnace, or should it vary from place to place?
4. Is it to be attained as quickly as possible?
5. Is it to be maintained steadily throughout the operation or varied?
6. How long is the treatment to last?
7. What chemical reactions are to be undergone by the material treated?
8. Are these reactions continuous? If not, how should they be varied?
9. Is the treatment to be continuous, working 24 hours per day and 7 days per week, intermittent, working 24 hours per day, or intermittent and working less than 24 hours per day.
10. What type of lining will be required?

These questions could be rearranged in a tabulated form, if necessary.

After this information has been obtained and often much more because of necessary variations in different processes, the correct type of furnace can be specified. It is self-evident that no one furnace could satisfy all kinds of work and what is more, no one furnace could do the work for different types of materials, even though they were to be treated the same way. It will be shown later, that even such details as size and shape of the object under treatment affect the design of the furnace.

In general, furnaces may be divided into two main groups, namely, blast and reverberatory.

In the blast furnace, the fuel and charge are in direct contact, and air pressure is forced *through* the two. In reverberatories, the fuel is burned either in a separate combustion chamber or above the charge, and only the flame or the heated products of combustion come in contact with it. The heat "reverberates" from the walls and roof of the furnace to the charge. The most prominent examples of the former are the iron, copper and lead blast furnace, for smelting

these ores; also the cupola for melting cast iron. As these are outside the scope of this article, no further detail will be attempted. As to the latter, even so far as the non-ferrous metal industry is concerned, its types and sub-types are legion.

The following table will serve as a basis for the further discussion of reverberatories.

I. Ore smelting furnace.
II. Metal melting—refining furnaces—open flame.
  1. Stationary.
  2. Tilting.
    a. Barrel.
    b. Upright.
III. Crucible Furnaces.
  1. Tilting.
  2. Pit.
IV. Muffle furnaces—heat treating.
V. Tunnel furnaces—heat treating.
  1. Stationary.
  2. Traveling belt.

Only a little space can be devoted to ore smelting furnaces, as they are outside the field of this magazine. The general principles, however, are fundamental and apply to all reverberatories. Fig. 1 shows the general construction and the path of the heat.

3. Exits for heat or vents.
4. Location of tap hole.
5. Type of lining.

The most desirable condition is that in which all parts of the furnace are equally hot. *There should be no cold spots.* Practically, however, this is not possible. Unless the furnace is lined with sources of heat on all sides, and from the top and bottom, there will always be some places out of the direct path of the flame which must get their heat indirectly, that is by radiation. The object in designing is to reduce these places to a minimum. In Fig. 2 we have the common type of oil or gas fired brass melting reverberatory, at present on the market. The arrows show the general path of the heat. At a glance, certain faults are glaringly apparent.

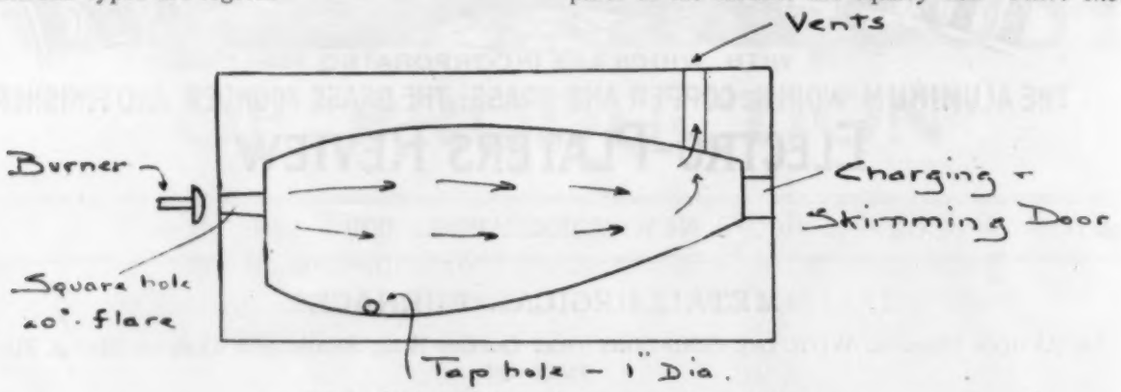



FIG. 2—COMMON TYPE OF OIL BURNING FURNACE.

1. The heat goes straight through the furnace and out through the vents. Material near the charging door is melted in a short time, but on running back toward the tap hole, cools at once.

2. The burner hole is square and has not sufficient flare. (Often the holes have no flare at all!)

3. The burner is badly located, as it directs the heat through the center of the furnace instead of along the roof arch. Of course, the charge in the furnace will deflect the flame, it will cause a sudden rise of heat where the first contact occurs. This will result in a hot spot in the arch and, further on a succession of smaller rises and hot spots alternating with cold.

To secure a better distribution of heat the vents should be placed in the other end of the furnace, if possible, *below* the burner hole (the reason for this is apparent from the sketch). If local conditions, such as the depth of the bed carried, make this impossible, the vents may be placed at the top, but they must be at the same end of the furnace as the burner. The tap hole should be moved forward so as to be a little

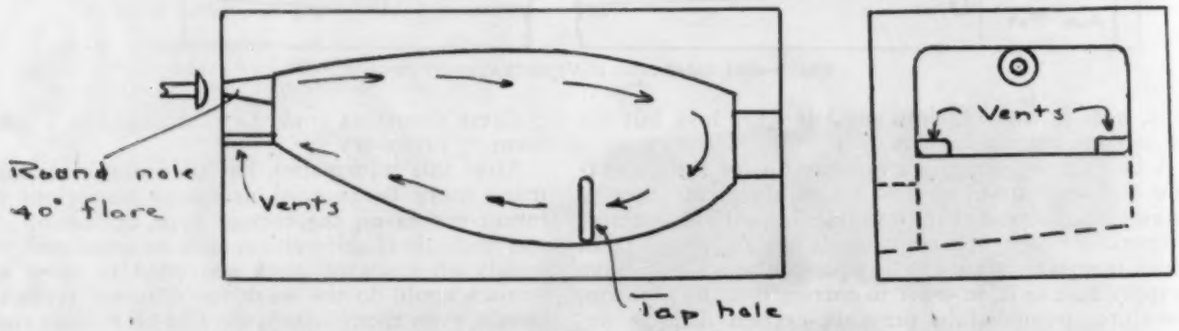



FIG. 3—PROPERLY DESIGNED OIL BURNING FURNACE.

METAL MELTING AND REFINING FURNACES—OPEN FLAME.

The stationary type is the same as the standard reverberatory, but on a smaller scale. Due to this change in dimensions, however, it is necessary to exercise particular care in the distribution of the sources of heat, the choice of fuel, the location of the vents and the location of the tap-hole. Given, for example, a brass or copper melting furnace, and a given capacity, how should this furnace be designed? The following points must be borne in mind.

1. Entrance or ports for heat.
2. Path of heat.

past the center of the furnace. This will bring it directly in the path of the heat. The burner hole should be made round, flared out into the furnace at an angle of about 30°-40° and tilted so as to direct the flame along the arch. Judgment should be exercised, however, in the placing of the vents, if they must be located in the roof. They should be out of the burner line and sloped back from the furnace toward the outer air, or the flame will shoot out directly. (Figs. 3 and 4 show this furnace changed in accordance with the above directions).

Aside from the question of heat distribution, the tap hole presents another difficulty. If the charge is a little cold, a hole as small as 1" is very likely to freeze; if a deep bath of metal is carried (and this is often desirable), it may be necessary to shut off the metal during a tap, in order to keep some melted metal in

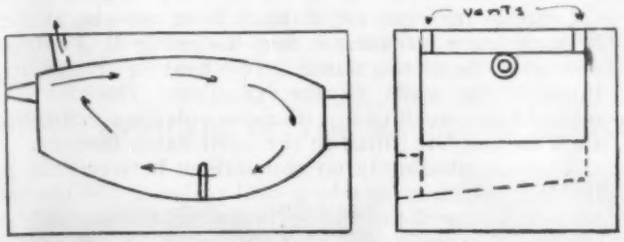



FIG. 4—PROPERLY DESIGNED OIL BURNING FURNACE.

the furnace at all times. This might cause freezing under certain conditions. Under others, for example, that of very high heat, a tap hole running from the bottom of a deep bath of melted copper is, to say the least, dangerous. Due to the high pressure, a runaway is always imminent, and might cause unthought of damage. The best type of tap hole is long, reaching from the floor of the furnace to the top of the bath, and at least two inches wide. This can be opened at the top and then the dam of clay cut down as fast as necessary to allow the metal to flow. Plugging is easy and the control is excellent.

Where oil or gas is used as a fuel, the vents are held down to minimum size. There should be considerable pressure of the gaseous products of combustion within the furnace, a sort of cushion, which effects a quicker and more general distribution of heat.

The coal fired reverberatory is operated on quite the opposite principle, namely: that of draft. There is no pressure in the furnace; the stack *pulls* the gases out of the heating chamber, while the burner *forces* the gases out of its heating chamber. The flame covers the whole width of the bed equally, however, if the furnace is properly fired, and the heat passes over the charge one way as a large blanket. Theoretically, it would be very desirable to have it travel back again over the charge, but so far this has never been successfully developed. What is done (as shown in Fig. 5) is to have the flue leading to the stack directly over the furnace, which gives the charge the benefit of some of the heat on its return passage.

A few words of caution would not go amiss. Coal fired furnaces are the oldest and best understood, as regards both their virtues and faults. They are not easy to run; they require skilled firemen and melters who will know enough, among other things, not to open the doors unnecessarily. The incoming air cools off the furnace and oxidizes the charge. The sulphur in the coal, if a little high, or incompletely burned, will injure the metal. Buck stays should be of steel, not cast iron, as the latter will crack under comparatively slight strain. The material used for plugging the tap hole may be clay, well packed and tight, or a mixture of fire clay and cement. The writer has seen both used successfully.

The lining varies, of course, with the material to be melted. For copper or lead a good grade of fire brick is satisfactory, but if the heat is carried to a high point (as in copper refining) chrome or magnesite brick is excellent. For aluminum, alundum brick is best.

The tilting reverberatory is simply a mechanical development of the stationary type. Its advantages are apparent. Aside from the ease of handling and the ability to clean itself thoroughly, a large part of the tremendous inconvenience and danger of tapping is avoided. The tap hole can be raised above the level of the metal, by tilting the furnace back, then opened in perfect safety, and the metal poured off at any desired rate.

Between the two other types of tilting furnace, the barrel and upright, there is little to choose. The barrel is the commoner and perhaps the more popular type. The writer prefers it because of the greater surface of the metal exposed to the flame, which means quicker heating and greater ease in effecting whatever chemical change is necessary. As the atmosphere within the furnace can be varied at will, there is no need for the larger surface of the metal to result in drossing or undesired oxidation. In addition there are various special makes of barrel furnaces, such as the "Duplex" which is simply two barrels, end to end with the intervening wall removed, and operated as one.

In buying or building a furnace it must be borne in mind that all that glitters may be anything but gold. Every engineering device of any kind can be varied in a thousand details. Many of these fine points really mean a great deal, but many of them mean absolutely nothing. They are simply "talking points."

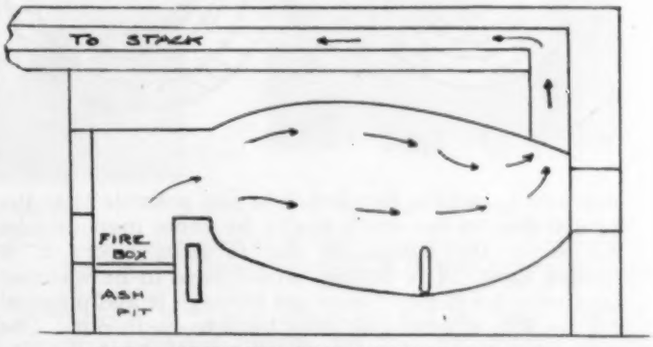



FIG. 5—STANDARD COAL BURNING FURNACE.

There is nothing that has so many possibilities for variation as a furnace, nothing in which so many details can be re-arranged. Only practical experience with furnaces can teach anyone which points are important and which are meaningless.

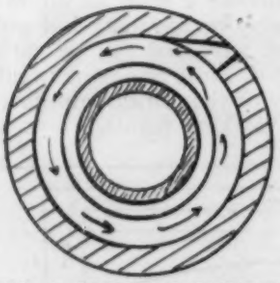
It is not the purpose of this article to compare different types of furnaces now on the market. The writer has not been fortunate enough to operate them all. Nevertheless, the faults in many of them can be seen from their design.

In general, it is admitted that the small reverberatory is not nearly so efficient and satisfactory as the large. Also, in spite of thousands of attempts to prove the contrary, a reverberatory furnace must be run 24 hours a day, in order to obtain good results from it. The amount of heat lost in starting and stopping is enormous, and it is too often forgotten that every

B. T. U. generated is paid for in advance. It is true that a small furnace can be started and brought up to heat in a comparatively short time (hence the development of the tilting furnace, which is different from the true reverberatory), but due to the small size, the amount of heat lost during the operation is much greater in proportion than in the large furnace.

There are several inherent faults in reverberatory furnaces which cannot be overcome. To begin with the charge is attacked directly only on the surface. The sides and bottom must get their heat by radiation from the walls and floor, and the floor is the last to heat properly, so that the bottom of the charge is always cooler than the top. The muffle furnace, which will be taken up later, is an attempt to overcome this difficulty, but there are so many obstacles in the way of muffles in a large furnace that it has never even been attempted, to the writer's knowledge. However, on a smaller furnace, it seems possible that the return flue to the stack might by some ingenuity be led *under the bottom* of the furnaces where it is needed most. The bottom would have to be watched carefully, for if metal ever ate through it and plugged up the flue it would be very hard to clean out. The thickness of the brickwork, the type of brick, its structure, so that it would bear the weight of the charge, would all have to be determined.

FIG. 6—PROPERLY DESIGNED CRUCIBLE FURNACE.



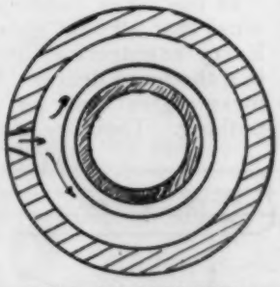


FIG. 7—COMMON TYPE CRUCIBLE FURNACE.

FUEL

To say offhand what is the most desirable fuel is not easy. As regards ease in handling, control and regulation, absence of machinery and general cleanliness, gas is by all odds the best. The outstanding objection is, of course, the expense. In or near the natural gas fields this objection is eliminated but there is still the problem of fluctuating pressure. In the East, the choice is largely between oil and coal. The writer's feelings are strongly in favor of oil. It is true that there is a certain amount of machinery to take care of but there is nothing very complicated in the installation. If the oil can be bought in any quantity the cost is as low as that of coal, and the ease of operation, and the reduction in the cost of labor are a clear gain. Moreover, the shut-downs on a coal furnace necessitated by cleaning the grates, the unavoidable ingress of cold air, the ash handling and the coal storage, the continual labor of stoking, and clinkering are a perpetual source of irritation and expense.

This must be said for coal, however. It is the "old reliable" method. It will work. If the proposition is too small to permit an oil installation, or if the temperament of the organization is such that they prefer old and tried methods rather than new and better ones, they should by all means use coal.

CRUCIBLE FURNACES

These are in use for two reasons:

1. To melt small quantities.
2. To retain all the constituents of alloys.

Crucible furnaces are distinct from reverberatories, or open flame furnaces, in that the material is entirely protected from the flame. The heat is transmitted through the walls of the crucible. The material melted loses much less of its more volatile constituents such as zinc, etc., than in the open flame furnace.

There is absolutely no comparison between the pit furnace, which is simply a coal pit with the crucible placed in it, and the tilting furnace. The latter is so far ahead in every way that discussion is almost useless.

One or two points in the design should be remembered, however. The crucible should be set so that it cannot slip, no matter what position it is in. This can be done by careful wedging and setting it into a recessed bottom or by other devices on the market. Another most important feature is the position of the burner. Figure 7 shows the ordinary design, with the flame impinging directly on the crucible and the base. This burns out both very quickly. Figure 6 shows a much improved method of applying heat. The flame spirals up around the crucible, without striking it directly in any place.

## BURNISHING METALS BY BALL TUMBLING

Use either of the following formulae for producing a bright and clean finish on steel by wet tumbling method.

1.

| | |
|---|---|
| Water | 1 gallon |
| Tri-sodium phosphate | 3 ounces |
| Sodium cyanide | ½ ounce |

2.

| | |
|---|---|
| Water | 1 gallon |
| Soda ash 58% | 4 ounces |
| Sodium cyanide | ½ ounce |

It is possible that these proportions may be reduced one-third if the steel parts are not too dirty. For tumbling brass parts use

| | |
|---|---|
| Water | 1 gallon |
| Tri-sodium phosphate | 2 to 3 ounces |
| Sodium cyanide | ¼ to ⅓ ounce |

or

| | |
|---|---|
| Water | 1 gallon |
| Cream of tartar substitute | 2 to 3 ounces |

In ball burnishing brass a good combination is

| | |
|---|---|
| Water | 1 gallon |
| Borax (powdered) | 1 to 2 ounces |
| Powdered olive oil soap | ¼ to ½ ounce |

Soap bark may be substituted for the olive oil soap.—C. H. P.

# NATIONAL ASSOCIATION OF WASTE MATERIAL DEALERS

SIXTH ANNUAL MEETING AND BANQUET HELD IN NEW YORK, MARCH 18-19, 1919.

The Sixth Annual Meeting of the National Association of Waste Material Dealers was held at the Hotel Astor, New York, on Wednesday, March 19th, the meeting being called to order by President Salomon at 10:30 A. M.

The meeting was well attended, about one hundred members being present when the meeting was called to order and others arriving later. Following the reading of the minutes of the previous meeting which were approved, the treasurer, Mr. Mark Sherwin submitted his report, which showed that the Association was closing its fiscal year with a balance of something like two thousand dollars ($2,000).

Following the Treasurer's report, President Salomon called for reports from the various divisions, which reports tended to show that the various divisions during the past year had rendered a real service, both to the members of the organization and to the Government, which had sought their assistance in a co-operative way to solve some of the problems developed during the war.

At this point, President Salomon read his Annual Report which was ordered received and placed on file, the Secretary being instructed to print same in a special issue of the "Association Bulletin" to be issued within the next few days. On motion of Mr. Sherwin a rising vote of thanks was given to President Salomon for the able and efficient manner in which he had conducted the affairs of the Association.

Following the reports of the President and Secretary, Mr. Feinburg, Chairman of the Nominating Committee, submitted a list of candidates for the various offices to be elected this year. The following were elected: For President, F. W. Reidenbach; for 1st Vice-President, James Rosenbury; for Vice-President, Henry Lissberger; for 3rd Vice-President, Ivan Reitler; for 4th Vice-President, Paul H. Lowenthal; for 5th Vice-President, Mark B. Speer; for 6th Vice-President, Harry Klonick; for Treasurer, David Feinburg. For Directors for two years, George B. Smithe-man, Julius Rosenberg, Herman Muchlstein and Herman Goldstein. No secretary was elected for the reason that the by-laws have been amended, providing that the Secretary shall be appointed by the Executive Committee. At the subsequent meeting of the Executive Committee, the present incumbent of that office, Charles M. Haskins, was appointed for a three-year term. L. D. Waixel was elected chairman of the Metals Division to succeed F. W. Riedenbach, the president-elect. Following the election of the new officers President Saloman turned over the chair to Mr. Reidenbach, the incoming President, who was very cordially received by the members.

Perhaps the most important action taken at the Annual Meeting this year was the unanimous vote in favor of the following resolutions:

"That the dues for membership be increased to $100.00 per annum, and that, therefore, Section 1 and 2 of Article 1 of the By-Laws be amended to read:

"Section 1. Dues shall be $100.00 per annum payable in advance.

"Section 2. Upon being notified of their election, members elected during the first six months of the fiscal year shall pay $100.00 dues and members elected during the second six months of the fiscal year shall pay membership dues of $50.00 for the current year."

"That the headquarters of the Association shall be moved from Boston to New York as soon as possible, taking into consideration the time required to find suitable accommodations, and also the fact that the present lease of the Boston office expires July 1, 1919."

A very successful banquet held on the evening of March 19, closed the Convention for 1919.

Seated at the head table with President Salomon, President-Elect Reidenbach and former President Birkenstein were the speakers of the evening, Captain William Harrigan of the "Fighting 77th," Dr. Willis Fletcher Johnson and Hon. David I. Walsh, United States Senator from Massachusetts. Throughout the dinner there was singing of popular songs by the entire gathering and music by the orchestra.

## OFFICERS OF THE NATIONAL ASSOCIATION OF WASTE MATERIAL DEALERS

F. W. REIDENBACH,
President, 1919.

C. M. HASKINS,
Secretary.

L. D. WAIXEL,
Chairman, Metals Division.

# ELECTRO-PLATING ON IRON FROM COPPER SULPHATE SOLUTION AND A REMARKABLE CASE OF PITTING IN ELECTRO-PLATING

Two Papers Presented at the Thirty-fifth General Meeting of the American Electro-chemical Society, in New York City, April 3-5, 1919

By Oliver P. Watts.*

For electro-plating on iron or steel from a copper sulphate solution, platers have in the past found it necessary either to give the metal a preliminary coat of nickel or to plate it with copper from a cyanide solution before transferring the object to the copper sulphate plating bath. Since the sulphate solution is much more satisfactory than the cyanide for the production of heavy deposits of copper, where these are required the plater has been compelled to maintain two different plating solutions, and to perform two distinct plating operations. The desirability of being able to plate directly on steel in the copper sulphate solution is apparent, and many persons have tried to discover a method of doing so, but until recently in vain.

The difficulty which proved insuperable in the many years that copper plating on iron has been practiced is the attacking of the steel by the electrolyte, and the deposition of copper "by immersion." When a strip of zinc or iron is dipped into a solution of copper sulphate, metal dissolves and a chemically equivalent amount of copper is deposited from the solution. This action is in its nature the same as the dissolving of a metal by sulphuric acid, differing only in that copper is plated out of solution instead of hydrogen. The trouble in plating upon a metal which receives such a deposit by immersion is two-fold: when reaction between the metal and the solution is rapid the character of the deposit is the same as that obtained in exeremely rapid deposition by the current, it is rough, powdery, and non-adherent; and since the driving force which causes the metal to be deposited is the going into solution of an equivalent amount of metal from the object which is being plated, there is a continual undermining of the foundation upon which the deposited metal rests, so that the plating blisters or becomes entirely detached after a short period of service. The remedy which naturally suggests itself is to use a large current at the outset, and cover the object with an electrolytic deposit so quickly that there will not be time for the corrosive action of the electrolyte to do serious damage. This method is successful when the rate of attack by the electrolyte is slow, *i. e.*, when the E.M.F. between the object and the metal constituting the deposit is small, but when this E.M.F. is great, even starting in, or "striking," at a high current density fails to overcome the trouble. It is for these reasons that platers have found it impossible to secure from neutral or acid solutions of their common salts an adherent electro-plate of copper, silver, platinum, or gold on such electro-positive metals as magnesium, zinc, or iron.

At the annual convention of the American Electro-platers' Society held at Detroit in July of last year, a paper was presented by John Satka, of the Chicago Branch,[1] which gave a method of copper-plating on iron or steel from a copper sulphate solution without the usual preliminary plating in the copper cyanide or the nickel solution. The method consisted in immersing the cleaned steel in a solution of 8 ounces of arsenious oxide to a gallon of hydrochloric acid (60 g. per liter), rinsing, and plating in the copper sulphate bath at a current rensity of 10 to 15 amperes per square foot (1.10-1.65 A. per sq. dm.). Care should be taken that contact with the cathode rod is made as soon as the steel touches the solution. Since it is necessary that the arsenic dip shall reach every portion of the surface of the steel, the articles should be dipped in the solution several times to insure complete substitution of the rinse water by the arsenic dip. Under these conditions a bright copper coating is deposited, which will withstand polishing, scratch-brushing, and ball-burnishing. This method is already being used by a number of platers, and seems destined to wide usefulness.

In seeking a reason for the remarkable effect produced by immersion of iron in the arsenic solution, one naturally thinks of the prevention of the corrosion of iron by hydrochloric or sulphuric acid that is brought about by dissolving a little arsenic in the acid. Although a striking coincidence, this other effect of arsenic furnishes no key to the mystery under consideration. Arsenic prevents corrosion of iron by providing a cathode material on which the potential required for the evolution of hydrogen exceeds the potential of iron, so that iron is unable to displace hydrogen from the solution, and corrosion of the iron ceases;[2] but when plating on iron from copper sulphate solution the trouble heretofore experienced has been due to the displacement of copper, not hydrogen, and the ability of arsenic to prevent the displacement of hydrogen by iron seems to offer no explanation of the beneficial effect of its presence in this case.

During immersion in the arsenic dip used by Mr. Satka, a coating of arsenic, more or less perfect, must be deposited on the iron, and it is the presence of this coating of arsenic that makes it possible to secure an adherent deposit of copper. But how? Heretofore deposits produced by simple immersion have been regarded with suspicion by the plater; if thin, they do not protect the iron, but rather accelerate rusting, and if an attempt be made to secure a thick deposit by prolonged immersion of the iron, the entire deposit is liable to come off. Does this film of arsenic differ in some fundamental way from all other deposits produced by immersion, or can its beneficial effect in plating on iron with copper be brought about by other metals? Experiment alone can answer this question.

The only metals which give any promise of furnishing a substitute for arsenic are those which are below iron, and are above or but a trifle below copper in the electro-chemical series. The other metal must be below iron in order to deposit on iron by immersion, and should be above copper or but little below it, else the remedy will prove worse than the disease which it is hoped to cure. According to Neumann, the common metals which lie within these limits are the following:

| | Sulphate | Chloride |
|---|---|---|
| Iron | +0.093 | +0.087 |
| Nickel | —0.022 | —0.020 |
| Tin | .... | —0.085 |
| Lead | .... | —0.095 |
| Bismuth | .... | —0.315 |
| Antimony | .... | —0.376 |
| Copper | —0.515 | .... |
| Arsenic | .... | —0.550 |

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[1]Trans. Am. Electrochemical Society (1912), 21, 337; (1917), 32, 257.

[2]Trans. Am. Electrochemical Society (1912), 21, 337; (1917), 32, 257.

Measurements, by the writer, of the E.M.F. between copper and copper plated with arsenic, antimony, and bismuth, gave values of 0.034, 0.068 and 0.042 volts, respectively. All three metals were positive to copper, but only bismuth precipitated copper from the acid sulphate plating bath used in the experiments which follow. The failure of antimony to do so is probably due to the formation of an insoluble basic sulphate.

Of the metals in the list above, nickel lies too close to iron to yield a deposit by immersion, hence none of its salts were tried as dips for iron, but solutions of each of the others were used as preliminary dips before copper-plating.

It is of course essential that the coat of metal obtained by immersion shall be smooth and fairly adherent; much trouble was experienced in obtaining such a deposit with some of the above metals.

### THE ARSENIC DIP.

In using the arsenic dip the concentration of arsenious oxide was varied from 10 to 60 grams per liter of hydrochloric acid, and the acid was also diluted with two volumes of water without detriment to the effectiveness of the dip. Good results in copper-plating were obtained with a variation of the time of immersion in the arsenic dip from 10 seconds to 6 minutes. Several specimens failed to take a perfect coat of arsenic, as was shown by removal of the copper plate from portions of the sheet by the scratch brush. The reason for these failures were not apparent, as the sheet iron had been put through the usual cleaning process, *viz.*, removal of mill scale by hydrochloric acid, rinsing, brushing with a brass scratch brush to brighten the surface, dipping for an instant in the pickling acid, rinsing, immersion in the arsenic dip, rinsing, and plating. Sulphuric acid was tried as a solvent for the arsenic instead of muriatic, with only slightly less satisfactory results.

### THE LEAD DIP.

A lead dip was prepared by diluting 40 c.c. of the lead fluosilicate plating bath with 400 c.c. of water, adding 100 c.c. of fluosilicic acid, and a solution of 4 grains of gelatine. This acted slower than the arsenic dip, and required about 30 seconds' immersion to insure a good copper plate on iron. There were less failures from bad spots in the copper plating than with the arsenic dip. Solutions of lead nitrate acidified by nitric acid and of lead acetate made acid by acetic acid were also tried, but the copper plate could be rubbed off in every case in which these dips were used. Their failure as dips is probably due to the crystalline nature of the lead deposited from them.

### THE ANTIMONY DIP.

In experimenting with antimony chloride, a very concentrated solution of magnesium chloride, strongly acidified with hydrochloric acid, was used as a solvent, in order to lessen the amount of hydrochloric acid which would otherwise have been necessary to keep the antimony in solution and to prevent a black, spongy deposit of antimony on the iron. About 1 c.c. of formalin was added per 100 c.c. of solution, to diminish attack of the iron by the hydrochloric acid. In order to obtain uniformly good deposits of copper by the use of this dip it was found necessary to acidify the copper plating bath more strongly than when using the arsenic and lead dips.

### THE BISMUTH DIP.

From solutions of bismuth chloride it proved very difficult to get a smooth, bright deposit on iron by immersion. In spite of the use of magnesium chloride and hydrochloric acid in the dip, a trace of water on the iron when immersed would cause a black smut to be deposited. By dipping the iron in concentrated hydrochloric acid just before immersing in the bismuth dip some fair-looking coats of bismuth were obtained, but except in the case of two narrow strips of iron, a good copper plating could not be obtained over the bismuth; the copper solution seemed to get through the bismuth coating and attack the iron, for the copper plate was easily rubbed off. Deposition of copper on bismuth by immersion was found to take place slowly, and to give a coating of copper which stood severe scratch-brushing.

### THE TIN DIP.

An acidified solution of tin chloride seemed to give a good deposit of tin on iron by immersion, but it was impossible to obtain a good plate of copper after using the tin dip, although copper deposits on tin rather quickly by immersion. A good copper plate was obtained on a bar of tin. The reason for the failure of the tin dip is not clear.

### THE COPPER DIP.

Success with the antimony, arsenic, and lead dips suggested an attempt to copper-plate iron by the use of a copper dip made up on similar lines, *i. e.*, a solution weak in copper and highly acidified. It was found that increase of acid in a dilute solution of copper sulphate slows down the rate of deposition by immersion on iron, and with a solution of copper sulphate in concentrated sulphuric acid the deposition of copper becomes very slow. All attempts to plate upon such deposits failed.

The finding of several other metals which may be substituted for arsenic as the basis of a dip for the plating of iron from a solution of copper sulphate, seems to indicate that the beneficial action of arsenic consists merely in its forming a coating over the iron which adheres fairly well, and protects the iron beneath for the brief time, 4 or 5 minutes, needed to give it a coat of copper by the current. To confirm this view it seemed desirable to try the arsenic dip as an aid to plating with some other metal than copper from a solution that does not give an adherent deposit on iron. For this purpose bismuth was selected as the substitute for copper.

### PLATING ON IRON WITH BISMUTH BY AID OF THE ARSENIC DIP.

Fifty grams of bismuth oxide was dissolved in 100 c.c. of concentrated hydrochloric acid, to which 10 c.c. of formalin was added to minimize attack of the iron by the acid. When tested by plating on copper, a gray, adherent deposit was obtained. On iron the deposit by the current peeled in spots at the end of five minutes, and a scratch brush removed most of what remained. However, both the arsenic and antimony dips made it possible to get a good, adherent plate of bismuth on iron. Use of the lead dip resulted in the bismuth plate taking the form of a black smut. An attempt to plate on sheet lead with bismuth showed the failure of the lead dip to be due to attack of the lead by the plating bath, with deposition of the smut. Owing to the brittleness of bismuth, it cannot be recommended as suitable for general use in plating.

### SILVER-PLATING BY AID OF THE DIPS.

Acid solutions of silver salts give a spongy deposit on iron by immersion, and plating from them is therefore a failure on iron. Tests of the above dips as aids to plating on iron from an acid solution of silver fluoborate resulted in non-adherent deposits in every case. This is not surprising in view of the distance that silver is below arsenic, antimony, and lead in the electrochemical series. On dipping these three metals in the silver-plating solution a black, spongy deposit instantly formed on each metal. This failure of the dips for silver-plating made

their testing for plating with gold and platinum, metals of still lower potential, unnecessary.

THE ARSENIC DIP FOR COPPER-PLATING ON ALUMINUM.

One of the most successful methods of plating on aluminum, a problem that long baffled the plater, consists in dipping the cleaned aluminum for a half minute into dilute hydrochloric acid which contains 1 per cent of ferric chloride, and then plating with nickel. The beneficial effect of this treatment is believed to lie in the deposition of iron by immersion, to which metal the nickel plate adheres well. If a perfect coating of arsenic, antimony, or lead could be given to aluminum by the dips previously employed, it should be possible to plate aluminum with copper instead of nickel, which, for obvious reasons, it is now necessary to use.

On immersing aluminum in the bismuth and tin dips, a black smut at once formed, so these were abandoned. Several samples of copper plate on aluminum were prepared by aid of the arsenic and lead dips; they stood polishing, but on cutting away the edges of the sheet and stripping off the copper plate, adhesion seemed slightly poorer where the sheet had been immersed in the dip than it was above this point. No beneficial effect was observed for any of the dips used.

In the experiments in copper-plating on iron, flat sheets, 2 by 6 inches (5 by 15 cm.) were employed; it is therefore impossible to draw conclusions regarding the effectiveness of the dips on the large and irregular material that frequently must be plated in commercial work. Objects with deep recesses, into which the copper sulphate solution will not "throw" well, may be expected to cause trouble in using the arsenic dip, and may prove impossible to plate by this means. Although adhesion was good enough to stand polishing, it is inferior to that of the ordinary electro-plate, in the production of which deposition by immersion has played no part.

Some misanthrope, who would discourage human endeavor, once said "There is nothing new under the sun," and a study of the history of the most revolutionary discoveries in science seems to bear out this statement. In spite of the novelty of the arsenic dip, and the accomplishment by its use of that which had been regarded as impossible, the principle underlying its action has long been employed by platers in the "blue" or "quick" dip. This consists of a salt of mercury dissolved in potassium cyanide, into which articles of copper or brass are dipped before silver-plating. Its purpose and method of operation are exactly those already set forth in explanation of the arsenic dip; mercury is deposited on the other metal by immersion, and lowers the potential of the object to be plated so that corrosion by the electrolyte is diminished, and in consequence there is a slightly better adhesion of silver plate when the "quick" dip is used. Since the potentials of copper and brass in dilute cyanide solutions are not much greater than that of silver, the attack of these metals by the silver bath is not severe, and a very satisfactory silver plate can be secured on copper or brass without employing the "quick" dip.

The arsenic dip is merely the latest case in which the plater's old enemy, deposition by immersion, has been made an ally by the simple expedient of introducing an intermediate stage—the deposition by immersion of a metal that is only part way down to the potential of the metal with which it is desired to plate the electro-positive metal.

SUMMARY.

It has been discovered recently that by immersing iron for a few moments in an acidified solution of arsenious oxide, an adherent copper-plate may be deposited from an acid electrolyte, but no adequate explanation had been offered for this unique effect of arsenic. In this paper it has been shown that certain solutions of lead and antimony may be substituted for the arsenic dip, previous to direct-current plating of copper on iron from copper sulphate.

It appears to be impossible to obtain a perfect plate on iron from solutions of bismuth chloride by the usual methods of electro-plating; but use of the arsenic or antimony dip is attended with the same successes as in copper plating.

The successful substitution of solutions of antimony and lead for arsenic, and the application of these dips to plating on iron with bismuth, show that the benefiial effect of the arsenic dip is not due to a property peculiar to arsenic alone, but is the result of coating the iron with a metal whose potential in acid solutions is so near to that of copper that it is possible to deposit a good copper plate upon it, yet whose potential is not so far below iron that it will deposit on iron in a powdery, non-adherent form.

## REMARKABLE PITTING OF ELECTRO-PLATING

Although the conditions which led to the usual pitting which is the subject of this brief paper are very seldom met with in plating, the possibility that others may encounter the same difficulty makes it seem desirable to describe the phenomenon, and to tell its cause.

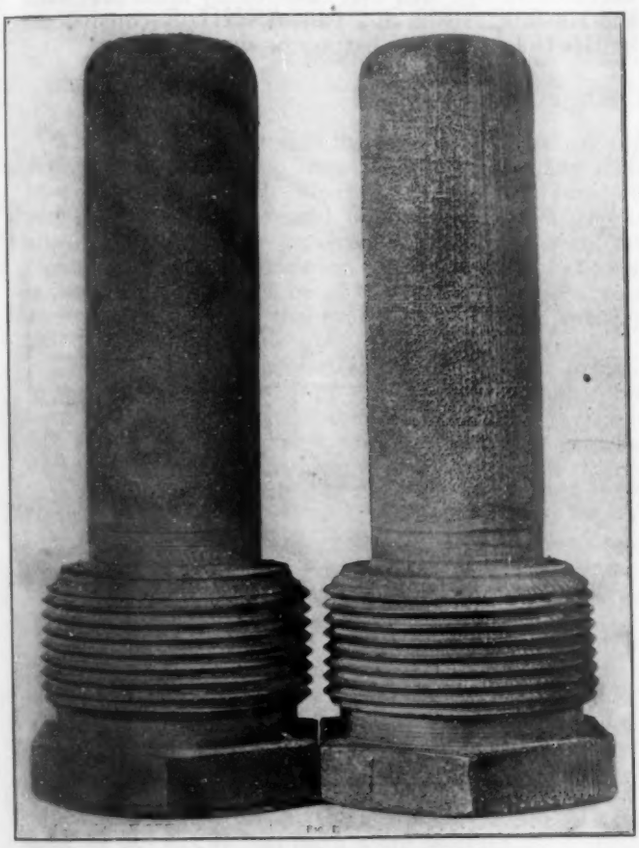
The trouble occurred in giving steel articles a plating of lead 0.010 inch (0.25 mm.) thick from a solution of lead fluosilicate, and consisted in the lead coating being more or less completely perforated by hundreds of small holes, which, from their size, may best be called pin-holes, and which of course rendered the lead plating useless.

A peculiarity not shown in the accompanying picture is the tendency of the pits to appear first along a sharp edge, *e. g.*, where a line of slag had been removed by the pickling solution. The most surprising thing about this attack of pin-holes was its suddenness and severity. Plating had been going on for six weeks before the trouble developed, but at its first apearance a half day's output of the plating tanks was spoiled. The trouble then grew less, and soon ceased. Several days later it recurred, all plating from the three tanks being badly pitted. Plating was then stopped until the cause of trouble could be determined and a remedy found.

There was much mineral oil on the articles as received at the plating room, and some of this was found to be carried over from the electric cleaner employed to remove it into the acid pickle used to remove rust just previous to plating. The hydrogen set free from the acid broke this up into microscopic drops which were found floating on the surface of the pickle, through which the work must be withdrawn. Complete elimination of the oil, however, did not stop the pin-holes.

The observation that many of the holes extended only part way through the lead coating furnished the clue to the cause of the trouble, *viz.*, that the holes were due to the collection of bubbles of air which was being slowly expelled from the plating bath.

During the hot weather of July and August, when the temperature of the solution was 115 to 120° F. (44 to 47° C.) and the tanks were in use 24 hours a day, this trouble did not occur; but the coincidence of the cool nights of September with an insufficient supply of material to be plated, so that the tanks occasionally stood idle from 8 p. m. to 9 or 10 a. m., permitted the solution to cool from its working temperature to about 78° F. (25° C.); this cool solution then dissolved a considerable quantity of air. When the current of 900 amperes was turned on, four or five hours were required for the solution to regain its normal working temperature; during this time the dissolved air was slowly expelled and collected in minute bubbles, which clung to the articles that were being plated and so caused the pin-holes. A similar expulsion of dissolved air is seen when a tumbler of cold,



A REMARKABLE EXAMPLE OF PITTING IN LEAD PLATING.

aerated water is brought into a warm room; bubbles of air slowly gather on the sides of the tumbler. The large current used, the high resistivity of the solution in comparison with the copper sulphate bath, for example, the small surface exposed to the air (the tanks were 28 inches (70 cm.) deep and slightly less in width), and the heat insulation furnished by the 3-inch (7.5 cm.) plank of which the tanks were constructed, all contributed to the trouble, since their combined effect was to make the operating temperature of the solution over 20° F. (11° C.) above that of the room. The three hours required for deposition gave ample time for bubbles of air to collect.

The difficulty was overcome by heating the solution to a little above its working temperature by means of a lead steam coil before resuming plating, whenever the tanks had been out of use for any considerable time.

Similar trouble by gas-pitting may be expected whenever a plating solution that is used for heavy deposits, and operates at an elevated temperature, stands idle and cold for many hours; but if there is a steady evolution of hydrogen from the cathode during normal operation of the bath, as with the cyanide copper or the brass solution, no trouble need be anticipated, for the stream of gas, ascending along the surface of the metal, will prevent bubbles from clinging long enough to form pits in the plating. Pitting may be expected only when the rate of evolution of gas from the work is extremely slow.

## THE HARDENING OF ALUMINUM BRONZE.

Of all non-ferros alloys, perhaps the most interesting are the alloys of copper and aluminum, and especially the binary alloys of these metals containing not more than 15 per cent. of aluminum. An important property of these alloys, relating to their hardening, has so far not been sufficiently investigated.

This property is as follows: As long as the maunt of aluminum does not exceed 7 per cent., treatment by means of heat seems to have little or no effect; as soon, however, as the percentage exceeds this amount, the hardness of the alloy can be modified within very wide limits by the action of heat and by the addition of other elements, such as iron and silicon. These modifications of the hardness open up opportunities for the use of these alloys which were unknown until the property had been satisfactorily tested by means of a number of differently treated samples. This phenomenon should be of special interest to engineers and other users of cast bronze parts, as the prevailing opinion hitherto has been that brass and bronze belong to the relatively soft metals.

When, however, a degree of hardness exceeding 100 degs. according to the Brinell scale is desired, this can be obtained without difficulty and without rendering the metal brittle and technically unsuitable for use by exposing it to the action of heat. Hitherto it has been usual, on account of its hardness, to employ steel in many cases in which bronze would have been otherwise employed on account of its capacity for resisting corrosion.

Aluminum bronze alloys, containing about 10 per cent. of aluminum, possess properties resembling those of Swedish Bessemer steel containing about 0.35 of carbon, and amongst others, the property of becoming harder when exposed to heat.

When this alloy is heated to various temperatures, up to about 800 degs. C., it will, when quenched, exhibit a hardness varying between 100 and 200 degs. Brinell; the hardness increasing approximately in proportion to the cross sectional area of the metal part. Bronze, the hardness of which just exceeds 100 degs. Brinell, is particularly suitable for many manufacturing purposes, more especially if it possesses in addition properties that render it suitable for use in bearings.

Bearings lined with bronze hardened by heat treatment have given very satisfactory results when running at about a speed of 20,000 revolutions per minute, whilst softer bronzes proved entirely unsuitable, as they change their shape. The following table gives the various tensile strengths of a titanium-aluminum bronze containing 10 per cent. of aluminum, both before and after exposure to heat:

| | Limit of elasticity, kg/cm² | Resistance to tensile strength, kg/mm. | Expansion, per cent. | Contraction, per cent. | Hardness, Brinell. |
|---|---|---|---|---|---|
| Original alloy (Cast) ... | 9.6 | 59.80 | 19.5 | 23.7 | 100 |
| Original alloy (quenched) | 19.8 | 73.64 | 1.0 | 0.8 | 262 |
| Special heat treatment | 27.7–19.2 | 67.69–64.14 | 5.5–14.0 | 9.1–18.5 | 158–140 |

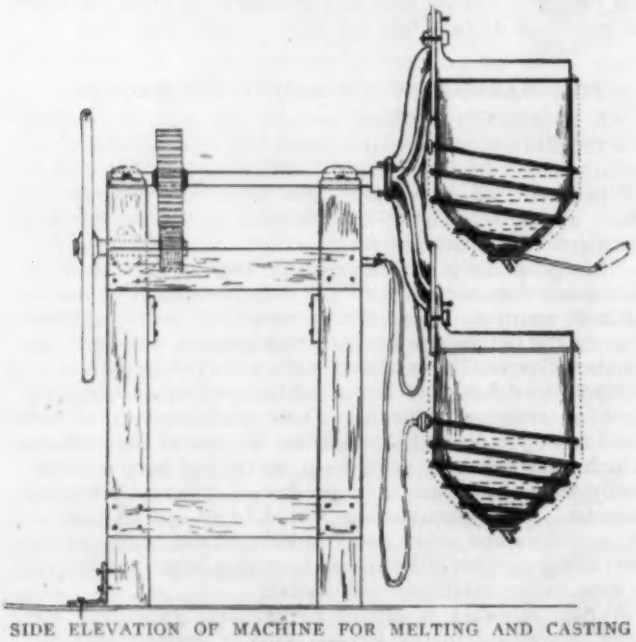
("Giesserei Zeitung," No. 11).

# A PRACTICAL WHITE METAL MELTING AND CASTING MACHINE

How Necessity Prompted an Inventor to Devise A New Method.

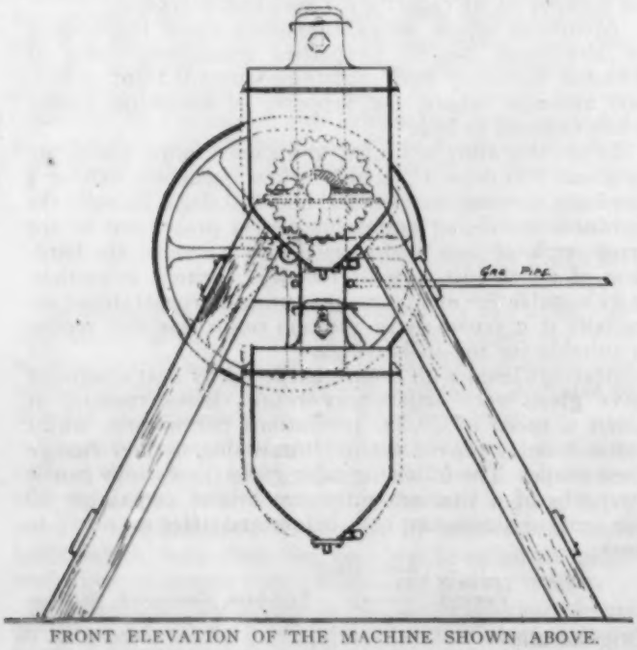
Written for The Metal Industry by A. F. Walter, Batavia, N. Y.

In a recent issue of The Metal Industry there appeared an inquiry in reference to desired information on the possibilities of making use of a method



SIDE ELEVATION OF MACHINE FOR MELTING AND CASTING SOFT METALS.

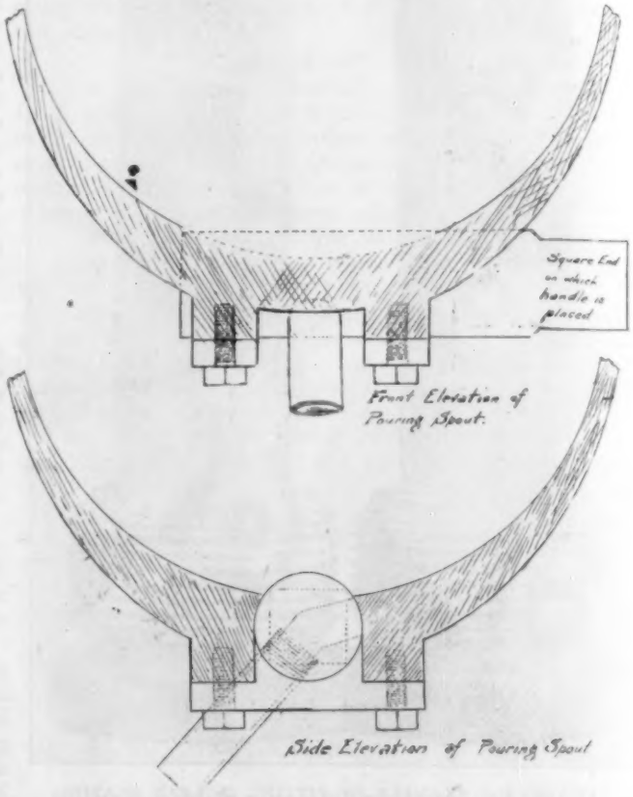
for melting and casting antimonial leads, spelter, and solders. These metals were to be drawn from beneath the melting pot or receptacle and not to be ladled out as in the method now in vogue.




FRONT ELEVATION OF THE MACHINE SHOWN ABOVE.

The inquirer undoubtedly had in mind a means of improving castings by making use of the better metal beneath the surface and the elimination of cold spots or blows due to the ladling process. This identical idea was brought forcibly to the writer's attention while watching a battery of five kettles in operation.

Not only was this ladling operation looked upon as cumbersome, but what is so very much more essential in these days, a great deal of precious time seemed to be wasted in ladling the metal to and from the mould, this refers particularly in the use of slush moulds. Having the designing of the products of our former factory in hand and with the object in view of not only improving the quality of our castings, but if at all possible, to reduce the time of production, I sketched out the idea that came to my mind first hand and which consisted of a pair of specially constructed kettles to be used as a battery or single unit.




FRONT ELEVATION (ABOVE) OF THE POURING SPOUT. SIDE ELEVATION OF THE SAME (BELOW).

With full authority to proceed and have an experimental machine constructed, I took my plans and consulted a mechanical engineer who adopted the two-kettle unit, but modified the plans slightly in the construction so as to facilitate the changing of kettles, also to conveniently pour the metal after attaining the proper heat.

The finished machine was duly installed and thoroughly tested on the average product, namely castings for novelties, and while these did not run very large in size, we were enabled to fully satisfy ourselves as to the usefulness of this new machine in various methods of casting.

Actual tests proved that we not only reduced the average weight of castings, but found these much sounder in structure and moreover reduced the oper-

ator's time regardless of the kind of mould used and this with less labor effort.

Possibly due to the more uniform heat of the metal and the improvement in the method of casting, we found the average increase in our output to reach as high as 25 per cent. aside from the proportionate reduction in time over the old method.

The sketches herewith will enable the interested to note the construction of this machine. Natural gas furnished the heating medium. Each kettle holds approximately 200 lbs. of metal. After the upper kettle was drained of its contents, the lower kettle was filled from a reserve kettle and brought into working position by means of the wheel on the rear of the frame. The loaded kettle swung freely and the larger cog-wheel had a pin set in a cog to prevent more than half a revolution of the kettles. Charcoal in powdered form was used to cover the metal, and this also prevented any metal from splashing when slushing out a mould.

The kettles were jacketed with suitable asbestos and sheet iron. In addition to this an apron made of asbestos was hung directly in front of the kettles. This naturally eliminated much of the heat from the operator. The spout arrangement, which is shown in detail, is a simple and ingenious device and made interchangeable to meet the requirements of the mould in use.

## A DEPARTURE IN ROLLING MILL CASTING SHOP PRACTICE.

### Some Experiences in Melting Metal With Natural Gas.

Written for The Metal Industry by W. J. Pettis.

When it is realized that the type of pit furnace and fuel used in the casting shops of the brass rolling mills have not been notably improved in the past hundred years, or the methods used in melting the non-ferrous alloys changed to any great extent, any news from the pioneer, who has touched even the border land of change, is received with interest by all rolling mill men, who, as a class, share strongly the conservatism of an industry that is highly localized.

There have been changes from the square pit furnace to the round type (and from coal to coke). Both types have their advocates. The tonnage production per crew has been largely increased, but in most other respects the operation has not changed much from the happy days when a helper paid his caster for the privilege of "learning."

It has been the writer's good fortune to become associated with a plant which had access to a good supply of natural gas, no traditions to hamper it, and a large order of cartridge brass to fill.

Gas as a fuel held out many promises in speed in melting, ease in handling, good control of furnaces, and, in view of the fact that there was no reserve of trained men in this line to draw on for operation of coal fires and other considerations, swung the decision in favor of gas, although there was no precedent to go by, as I believe this was one of the first rolling mills to use fuel other than coal or coke, though many foundries have used oil and gas as fuel for a score of years.

There were many difficulties to overcome, but, after much labor, a practical working furnace was developed, which justified itself both in operation and in the quality of its output. A battery of ten fires was operated, three shifts in twenty-four hours, each crew getting fifty pots in eight hours or less. It was a continuous operation. When one crew pulled its first pot, on the last round the pot was returned and changed and became the property of the succeeding crew, which took possession of each fire as the pots were pulled by the first crew. This continuous operation resulted in crucible economy, as there was no chilling of the pots, and they "wore out." Splendid furnace conditions were maintained as there was no cold furnace to reheat and a conserving of man energy, which is vital to the production of good brass.

There is no type of furnace or kind of fuel used that has presented problems that human ingenuity and skill have not met and evolved rules for producing "good" brass, and it is a violation of these rules that result in "bad" brass. And in the majority of cases, the violations are the result of physical exhaustion of the operators rather than criminal intent.

The record book of any large rolling mill employing a large number of casters will show a wide range of "excellency" in production of the same class of work, and yet a mental examination will show an equal knowledge by the men of the *modus operandi*. A physical examination will point out the trouble.

Any caster will tell that a tired fireman will do exactly what a tired fighter will do through the last rounds of a twenty-round bout. He will stall through them. A neglected pot in any detail means "blowy" metal, or a chilled bar, and it does not take many to pull down a caster's average. It is here where the gas fire literally shines; the things a fireman doesn't have to do are "a plenty." He doesn't have to carry some three thousand pounds of coal on a shovel for his turn, no pots going down on the grate bars to be pulled up and re-coaled—with all that entails—and no fires to punch out, or ashes to care for; it means that the energy thus dissipated is devoted to the careful handling of his melts.

The result has been that there was produced, with men newly trained, the high grade of cartridge brass demanded by the Government, and I am confident this could not have been accomplished with coal fires in the short time left to train the crews, for proper coal firing is an art.

No doubt there is a scientific side to this. It may be with natural gas as a fuel reducing flame that is not soluble in the metal, is produced, or that the oxygen in the air is burned more completely in this type of fire, but as I am not prepared to handle this side of the question, I will pass it up.

The ultimate furnace will no doubt be electrically operated. But whatever the type may be, the furnace design that produces results and takes the least physical toll from the men operating it will be the one that will solve most of the casting shop problems.

It will make the work possible for the average man to do, and thus admit of a wider field for selection of men. With the present type of casting shop pit furnace only the physically fit can stand up under the "punishment" and give proper care and attention to the work, and it is only with the greatest care and attention in this very exacting line of work that quality and economy can be made to travel hand in hand.

# ETCHING SOLUTIONS AND THEIR USES

## Some Valuable Hints for the Metallographist.

Written for The Metal Industry by Ernest G. Jarvis, Chief Chemist and Metallurgist McNab and Harlin Manufacturing Company, Paterson, N. J.

Etching is the treatment of a polished surface by liquids or gases, with or without heat, to produce structures and reveal the presence of different constituents.

The following remarks and data have been collected on this important subject, and it is hoped by the writer that they will be criticised to no end by the readers of this article, for in so doing something will be gained, which will be advantageous to the craftsmen.

There is one thing most important in making up reagents, never guess at percentages, but weigh your salts accurately and use the best C. P. chemicals, for impurities will very often injure the developed structure in such a way that the workman will be mislead and obtain wrong conclusions.

There is so much, however, that cannot be told, every operator knows his own metaliographic outfit best, and some prefer one kind of plates, paper, developing solutions, some prefer other solutions, plates and paper; the same in etching reagents and etches, some like one reagent, some prefer something else, while some like deep etching, and others prefer the opposite.

The writer offers the following information with the hope that it will be of use to the metallurgist at large, and that some may profit by it.

### AMMONIUM PERSULPHATE.

A 10 per cent. solution of ammonium persulphate is suitable for developing definite structures in brasses, copper, nickel silver, and might be considered the all-around etching reagent for the copper alloys as nitric acid is for the ferrous alloys.

It gives excellent results with low nickel alloys, i. e., under 10 per cent. nickel, copper aluminum, titanium bronzes, phosphor bronzes, cupro-manganese, manganese-titanium, and numerous other alloys. Law recommends this solution for brasses, bronzes, nickel silver and nearly all copper alloys, and appears to have been one of the first, if not the first, to use this reagent.

### HYDROGEN PEROXIDE.

Etching solution made of equal parts of ammonia and hydrogen peroxide is considered excellent practice for observing oxygen inclusions in copper.

### NITRIC ACID.

A 10 per cent. solution appears to be generally used, made up with alcohol.

Some metallurgists and metallographists use this reagent for brasses and bronzes, while others claim it has a tendency to twinning of the structures. This reagent is the universal reagent for iron and steel and the ferrous alloys. With manganese and chromium steels this solution gives excellent results. Hiorns in his book entitled "Metallography," shows many excellent bronze structures developed with dilute nitric acid; in fact, Hiorns appears to prefer nitric to all other etching solutions, while Rosenhain says that nitric acid causes uneven oxidization of the metals, especially in iron and steel alloys, and that he prefers a solution of picric acid, which is far more stable.

Law recommends this solution for etching silver alloys.

Gulliver recommends this solution for bismuth and uses it largely for most any copper alloy, including copper-arsenic, copper-bismuth, copper-antimony, copper-aluminum, lead-tin-bismuth, zinc-antimony alloys, bearing and babbit metals with goods results.

### FERRIC CHLORIDE.

A 10 per cent. solution of the C. P. sale in 100 cc. of water and 2 cc. of hydrochloric acid.

This reagent is used largely on lead-antimony alloys, is rather slow, but its development of structures is very definite and decided.

Rosenhain recommends this solution also for copper alloys, however, the writer has had very little success with copper alloys and ferric chloride.

Gulliver recommends this solution for bismuth alloys, copper-tin alloys, tin-antimony alloys, and aluminum bronzes.

### COPPER AMMONIUM CHLORIDE.

Copper ammonium chloride is made by dissolving 10 grams of the double salt in water.

This reagent is recommended and the writer has had excellent results with mild steel, wrought and swedish iron.

Gulliver used this solution with good results on copper-silver alloys.

### HYDROCHLORIC ACID.

A 1 per cent. solution in alcohol is generally used.

This solution is used on steels that have been hardened with good results.

Law recommends this solution for aluminum alloys.

### PICRIC ACID.

A saturated solution is most commonly used.

This reagent is next in line with nitric acid for etching ferrous alloys.

Rosenhain recommends a 4 per cent. solution for iron and all its alloys.

Gulliver recommends this solution for etching lead-antimony alloys.

### IODINE ETCHING.

The writer has had best results with a solution made up as follows:

| | |
|---|---|
| Potassium iodide ..... | 20 grams. |
| Iodine ..... | 10 grams. |
| Water ..... | 100 c.c. |
| Alcohol to make..... | 1000 c.c. |

Gulliver used this solution with good results on Delta metal and gray cast iron.

### COPPER CHLORIDE.

Copper chloride solutions are made up as follows:

Stead's Formula.

| | |
|---|---|
| Copper chloride ..... | 20 grams. |
| Magnesium chloride ..... | 80 grams. |
| Hydrochloric acid ..... | 40 c.c. |
| Water (sufficient to dissolve the salts) about ..... | 60 c.c. |

This is kept as a stock solution and the etching solution is made up by taking 15 c.c. of the above solution and diluting to 1000 with alcohol.

The writer has never used this solution, but understands it is largely used with iron and steel alloys.

### SPECIAL REAGENT.

Rosenhain's Reagent:

| | |
|---|---|
| Ferric chloride ..... | 30 grams. |
| HCl (conc) ..... | 100 c.c. |
| Cupric chloride ..... | 10 grams. |
| Stannous chloride ..... | 5 grams. |
| Water ..... | 1000 c.c. |

Rosenhain recommends this solution for determining the distribution of phosphorus in steel. The steel rich portions become stained by a deposit of copper while the phosphorus rich portions remain white.

SODIUM PICRATE

Is used for the detection of cementite.

ELECTROLITIC ETCHING

Is preferred by some for cupro-nickel, monel and other high nickel alloys.

AQUA REGIA

Made up as follows:

| | |
|---|---|
| $HNO_3$ | 1 part. |
| HCl | 5 parts. |
| $H_2O$ | 6 parts. |

is used for etching gold and rich gold alloys, palau, platinum and platinum rich alloys.

CAUSTIC SODA.

A ten per cent. solution is used for detecting impurities in aluminum and also for obtaining good definite structures of aluminum alloys, and for alloys rich in zinc.

CHROMIC AND NITRIC ACID.

Five per cent chromic acid in ten per cent nitric acid can be used for etching white metals, bearing metals, lead, tin and antimony alloys. Gulliver recommends this solution for nickel silver alloys.

SILVER NITRATE AND NITRIC ACID.

Concentrated nitric acid ($HNO_3$) containing 5 per cent silver nitrate ($AgNO_3$) can be used for the same purpose as chromic and nitric, and in some cases gives much better results.

AMMONIUM CHLORIDE.

A ten per cent solution is recommended by Gulliver for magnesium and magnesium-aluminum alloys.

For further information on this subject refer to the following:

Hiorns—"Metallography."
Rosenhain—"Introduction to Physical Metallography."
Sexton—"Alloys."
Roberts Austin—"Introduction to the Study of Metallography."
Gowlands—"Non-Ferrous Metals."
Law—"Industrial Applications of Alloys."
Gulliver—"Metallic Alloys."
Sauveur—"Metallography and Heat Treatment of Iron and Steel."
Primrose—"Metallography of Iron and Steel."

## MELTING POINTS OF CHEMICAL ELEMENTS

THE BUREAU OF STANDARDS, WASHINGTON, D. C., HAS JUST ISSUED CIRCULAR NO. 35, THIRD EDITION, WHICH GIVES THE MELTING POINTS OF THE CHEMICAL ELEMENTS.

MELTING POINTS OF THE CHEMICAL ELEMENTS

| Element | C | F |
|---|---|---|
| Helium | <—271 | <—456 |
| Hydrogen | —259 | —434 |
| Neon | —253? | —423 |
| Fluorine | —223 | —369 |
| Oxygen | —218 | —360 |
| Nitrogen | —210 | —346 |
| Argon | —188 | —306 |
| Krypton | —169 | —272 |
| Xenon | —140 | —220 |
| Chlorine | —101.5 | —150.7 |
| MERCURY | — 38.87 | — 37.97 |
| Bromine | — 7.3 | + 18.9 |
| Caesium | + 26 | 79 |
| Gallium | 30 | 86 |
| Rubidium | 38 | 100 |
| Phosphorus | 44 | 111 |
| Potassium | 62.3 | 144.1 |
| Sodium | 97.5 | 207.5 |
| Iodine | 113.5 | 236.3 |
| Sulphur | $S_I$ 112.8 | 235.0 |
| | $S_{II}$ 119.2 | 246.6 |
| | $S_{III}$ 106.8 | 224.2 |
| Indium | 155 | 311 |
| Lithium | 186 | 367 |
| Selenium | 217-220 | 423-428 |
| TIN | 231.9 | 449.4 |
| Bismuth | 271 | 520 |
| Thallium | 302 | 576 |
| CADMIUM | 320.9 | 609.6 |
| LEAD | 327.4 | 621.3 |
| ZINC | 419.4 | 786.9 |
| Tellurium | 452 | 846 |
| ANTIMONY | 630.0 | 1166.0 |
| Cerium | 640 | 1184 |
| Magnesium | 651 | 1204 |
| ALUMINUM | 658.7 | 1217.7 |
| Radium | 700 | 1292 |
| Calcium | 810 | 1490 |
| Lanthanum | 810? | 1490 |
| Arsenic | 850 | 1562 |
| Barium | 850 | 1562 |
| Praseodymium | 940 | 1724 |
| Germanium | 958 | 1756 |
| SILVER | 960.5 | 1760.9 |
| GOLD | 1063.0 | 1945.5 |
| COPPER | 1083.0 | 1981.4 |
| Manganese | 1230 | 2246 |
| Beryllium (Glucinum) | 1280 | 2336 |
| Samarium | 1300-1400 | 2370-2550 |
| Silicon | 1420 | 2588 |
| NICKEL | 1452 | 2646 |
| Cobalt | 1480 | 2696 |
| Yttrium | 1490 | 2714 |
| IRON | 1530 | 2786 |
| PALLADIUM | 1549 | 2820 |
| Chromium | 1615 | 2939 |
| Zirconium | 1700? | 3090 |
| Columbium (Niobium) | 1700? | 3090 |
| Thorium | >1700 | >3090 |
| | <Mo. | <Mo. |
| Vanadium | 1720 | 3128 |
| PLATINUM | 1755 | 3191 |
| Titanium | 1800 | 3272 |
| Uranium | >1850 | >3360 |
| Rhodium | 1950 | 3542 |
| Boron | 2200-2500? | 4000-4500 |
| Iridium | 2350? | 4260 |
| Ruthenium | 2450? | 4440 |
| Molybdenum | 2550 | 4620 |
| Osmium | 2700? | 4890 |
| Tantalum | 2900 | 5250 |
| TUNGSTEN | 3400 | 6152 |
| Carbon | >3600 | >6500 |

# THE BENDING AND FORMING OF BRASS ROD AND TUBES

PRACTICAL METHODS TO BE EMPLOYED FOR THE PRODUCTION OF METAL SHAPES.

WRITTEN FOR THE METAL INDUSTRY BY P. W. BLAIR, MECHANICAL EDITOR.

The bending of brass tubing and the forming of rods is an important item in the large or small brass manufacturing shop. The most practical method is to use annealed rod or tubing and bend with a machine while the metal is cold. For bending the work cold will enable one to attain considerable accuracy. Besides it often affords a test of the quality of the metal. In fact, any cold forming operation is a test of the metal.

In order to prevent the collapse of brass tubing while

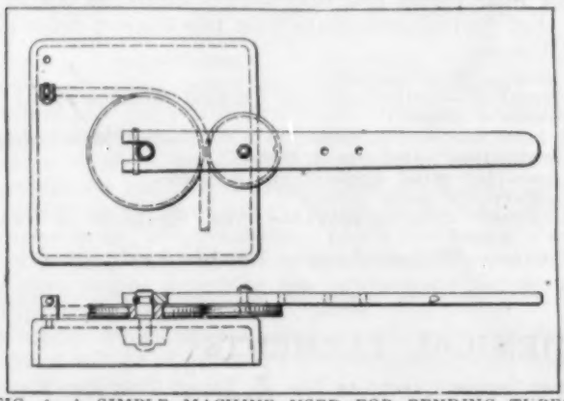


FIG. 1—A SIMPLE MACHINE USED FOR BENDING TUBES.

bending they may be filled with either lead or rosin. Lead may be used for filling the inside of tubes having large diameters and after the bend is made the lead may be taken out by means of heating the tube to the melting point of the lead. I have also used rosin for this purpose which can be removed by heating with a

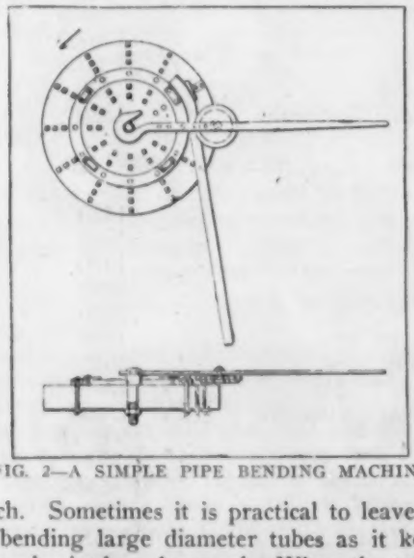


FIG. 2—A SIMPLE PIPE BENDING MACHINE.

blow torch. Sometimes it is practical to leave the rosin in after bending large diameter tubes as it keeps them from being bruised or damaged. When the tubes are to be heated or what is termed hot bending, sand is employed instead of lead or rosin. The tube should be plugged at one end and then filled with clean sand that has been properly dried, and rammed up to the plugged end. The sand should be thoroughly dried before using, otherwise steam will generate inside of the tube. A close fitting, soft annealed brass or iron rod is sometimes used as the filler to be taken out. When the whole length of the tube is to be a circle, a part of a circle, or a circular helix, then it may be possible to withdraw the rod after bending, but if the length is considerable there may be severe sticking because of variations in the regularity of the curvature. It is best to experiment a little with the rod filler before risking valuable work.

The most up to date method of bending brass tubing and rod is with the aid of a fixed mandrel and a rolling wheel. Both are preferably grooved on the edge, but not necessarily with grooves having radial sections the exact curvature of a cross-section of the tube. However, the curvature of the groove cross-section should not be sharper than the curvature of the cross-section. The mandrel may be a full circle or only a segment. For instance where there is a full circle the mandrel may be arranged in a horizontal position on a firm table. Fig. 1 shows a simple machine used in bending tubing.

The mandrel groove may be less than a semi-circle in cross-section and where it is less it may be advisable

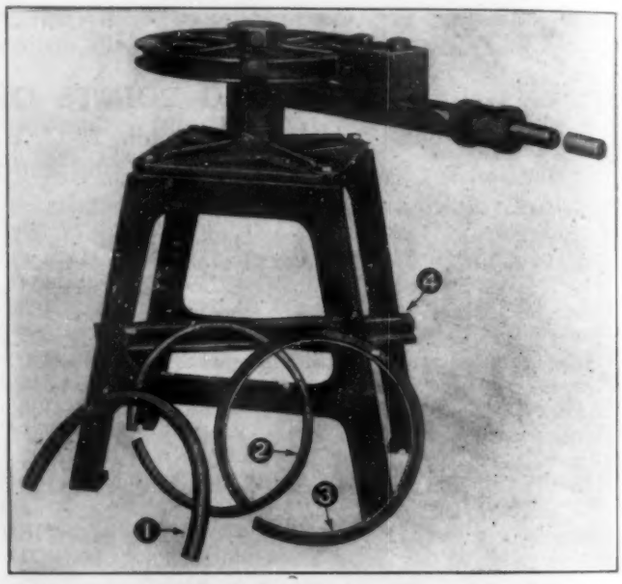



FIG. 3—RING AND PIPE BENDING MACHINE FOR HEAVY WORK.

to interpose a disc between the mandrel and the table. At the center of the mandrel a stout vertical pin is provided. This pin is to serve as a pivot for a horizontally moving crank or lever. Instead of the pin a vertical hole may be provided at the center of the mandrel into which the bent end of the lever may be slipped, and in some cases this may be the simplest thing to arrange, as it may not always be convenient or possible to provide a stiff upright pivot. However, whether it is a pin or hole the crank or lever is to use the center of the mandrel as the point about which it turns. The lever may be a simple straight rod with one end arranged to fulcrum at the mandrel center and the other to be grasped by the hands of the workman. Intermediate between the ends, the grooved wheel is suitably mounted to rotate in a horizontal plane. The bending is accomplished by forcing this grooved wheel to roll the tube on the grooved edge of the mandrel.

Naturally one end of the tube should be held securely during this operation and this may be done by means of a suitable device arranged on the table.

We now come to the question of the sizes of the mandrel and the wheel. The horizontal curvature of the groove in the mandrel should be exactly the same as the curvature of the bend desired. The size of the wheel on the lever may vary, but the larger it is the smoother the bending work. It will be understood then from the foregoing that a different mandrel will be necessary for each side of tube and that the same rotating wheel may be used for various sizes of tubes. However, it will be necessary to shift the notating wheel to different positions on the lever as the size of the bend varies, or in other words shift the fulcrum point. This last may be done by extending the lever at the fulcrum end.

As to the question of the material that should be used in making up the bending device, this will depend largely on the character and range of the work. A hardwood mandrel grooved out on a wood turning lathe will probably satisfy the most exacting requirements. Also a

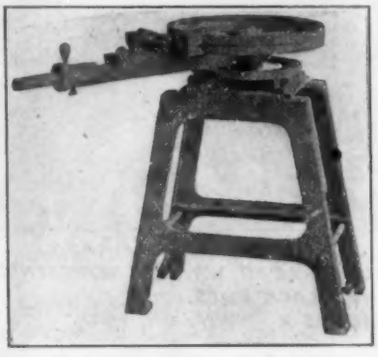


FIG. 4—MACHINE BUILT FOR LIGHT WORK.

hardwood rotating wheel will doubtless satisfy many conditions. In case wood is used for these purposes it will be advisable to line any wearing surfaces with metal. Thus if holes are provided in the lever for the insertion of pins or the like for the fulcrum and for the pivot or for the rotating wheel, then such holes may be bored out extra large and a short piece of metal tubing of the correct inside diameter inserted. In order that such pins will be rigid and firm, it will be advisable for them to have a goodly diameter and a good length, that they fit the metal bushings snugly and that the bushings require to be forced into the wood. In some cases it will be simpler and more economical to use a cast iron mandrel, grooving out the edge on the lathe where large quantities have to be produced. Fig. 2 shows a simple pipe bending machine.

The device for holding one end of the tube may vary from a pin stuck in a hole in the table or machine, or a screw eye screwed into it as a gripping arrangement holding the tube in any direction. Probably as good as any device for the general run of work is a pin set up close to the mandrel. The end of the tube is passed between the pin and the mandrel and a small block then inserted between the pin and tube. The side of the block next to the tube may be grooved to conform better to the work. It may be held in position by a wooden or metal wedge driven between this block and the pin or by a set screw arranged horizontally in the pin.

Copper tubes are quite easily bent, but in bending brass tubes the ease with which it will be done will depend upon the softness of the metal, how it is annealed and the quality or percentage of copper. Fig. 3 shows a ring and pipe bending machine for heavy work and will form rings up to 32 inches in diameter. No. 1 shows 1 inch regular iron pipe 20 inches in diameter; No. 2, ¾ inch solid round steel bar 16 inches in diameter; No. 3, "T" iron or brass 1 x 1 x ⅛ inch, 16 inches in diameter (all bent without heating) and No. 4, "V" bar used in connection with I. P. size brass pipe bending. This bar is placed between the pipe and rolled and follows point of bending, thus holding up the walls of pipe to a very large degree to prevent flattening. Fig. 4 is a machine built for light work.

The machine shown in Fig. 4 is built for small diameter pipe and tubing and is not capable of making a complete circle, as the material formed will remain straight for a distance of about 2 inches at each end and in order to make complete rings the ends have to be formed up slightly by hand when they are being joined together. This machine is especially valuable for making V shapes and curves of any degree.

There are other machines manufactured for making some special bend, but the two that are illustrated are adapted to a wide variety of work with different forming dies. The plunger type of pipe bending machine is very costly and when the inside diameter of tubing varies slightly the plungers stick inside, and to really be a success the inside diameter of the pipe has to measure very close to limits.

An angle bending machine is shown in Fig. 5. This machine is intended for forming light stock into rectangular shapes without heating and can be conveniently mounted on an ordinary work bench. As will be seen in the illustration a piece of flat stock is inserted ready for bending. The operating lever is about 20 inches long and by pulling it around it rotates the dies in which the stock is held, forcing the extended end of stock against the stationary back die, thus forming it into any angle desired, less than 90 degrees.

When a greater degree of angle is required it may be accomplished by means of special forming dies made to suit the work. There is a stop block on the machine

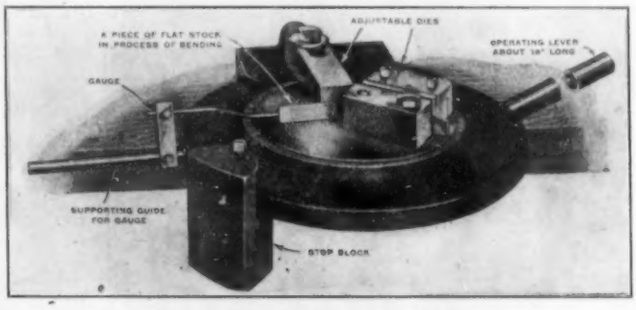



FIG. 5—ANGLE BENDING MACHINE.

which may be set to suit the degree of bend that it is desired to make. It is always difficult to bend an angle bar whether it is to be convex or concave, as it depends a great deal on the breadth of the piece to be curved, the radius of the curve and also on the character of the metal and the success of the annealing. When it is necessary to bend pipes by hand without the use of special tools or machines, fillings, as mentioned in the fore part of the article, should be used. Also, if the metal is thoroughly annealed before bending good results will be obtained.

## TO DEPOSIT LEAD ON COPPER.

Dissolve 7 ozs. of caustic potash or soda (soda equally good) and ¾ oz. litharge (lead oxide) in a gallon of water. Boil until lead salts are nearly all dissolved. Copper articles first, then plate slowly with frequent scratch brushings, and proceed as with tinning.—H. C. W.

# RELATIONS OF LABORATORY RESEARCH TO MILL PRACTICE

AN ARTICLE IN THE SCOVILL BULLETIN* FOR FEBRUARY SHOWS THE VALUE OF CLOSE CO-OPERATION.

With the development of the microscope, pyrometer and allied instruments, the metallurgist has been able to probe beneath the surface of metals in the same way that a surgeon investigates a wound in the human body. In other words, where a surgeon is an expert on injuries and

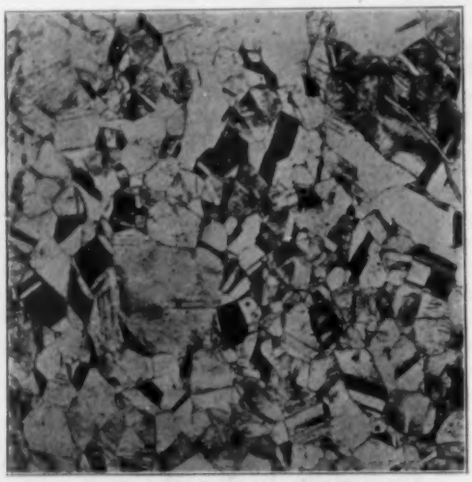


FIG. 1. BRASS BAR CONTAINING 71.85% COPPER. DID NOT BREAK IN ROLLING.
MAG. 75 X, $NH_4OH$, $H_2O_2$

imperfections of the human body, the metallurgist is an expert on these things related to metals.

The study of metals by means of chemical analysis, the microscope and the physical testing machine, is rather recent; nevertheless, it is very evident from its already wide application that a greater future is in store for it.

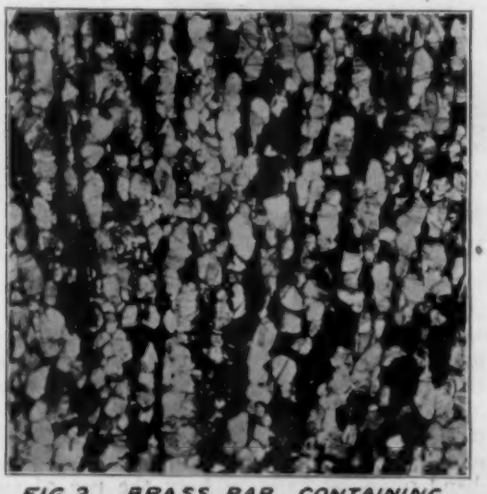


FIG. 2. BRASS BAR CONTAINING 59.97% COPPER. BROKE IN ROLLING. THE DARK AREA IS BETA.
MAG. 75X $NH_4OH$, $H_2O_2$

When we realize that all the brass artillery cases made during the war had to pass certain chemical, physical and structural tests before they were accepted by the government inspectors, we see what importance is becoming attached to these methods. Very few people realize how rigid specifications are until they are confronted with them. The secret of success in meeting specifications lies to a considerable extent in laboratory control and interpretation of the technical specifications in terms of shop practice.

Not only manufactured articles of brass, but the raw

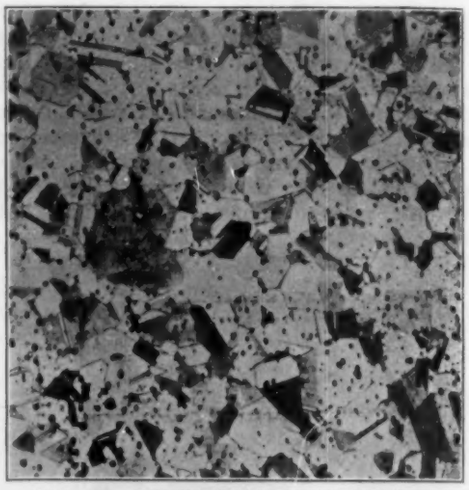


FIG. 3 COMMON HIGH BRASS CONTAINING LEAD WHICH IS REPRESENTED BY THE BLACK DOTS.
MAG. 75 X $NH_4OH$, $H_2O_2$

materials, such as rods and flat metal, have to pass certain rigid tests before their acceptance. Government specifications are in some cases extremely difficult to meet, from a physical standpoint, due to the combined high elongation, high tensile strength, and high yield point requirements. This particular combination calls

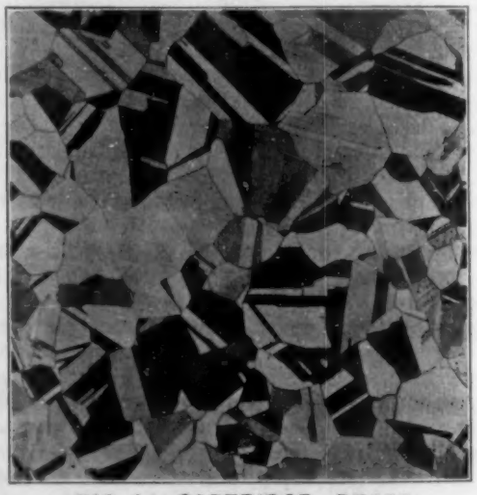


FIG. 4 CARTRIDGE BRASS ANNEALED AT 650°C. NOTE LARGE CRYSTAL FACES
MAG. 75 X $NH_4OH$, $H_2O_2$

for an extremely narrow range of temperature control. A brass alloy may consist of a mixture of ductile Alpha and hard Beta, in which case it requires different treatment than a more normal brass containing over 63.5 per cent. copper, such as is characteristic of common high or cartridge. One would naturally assume that brass

*Issued by the Scovill Manufacturing Company, Waterbury, Conn.

was brass and proceed to anneal such an alloy the same way as had been the custom with Alpha brasses (copper over 63.5 per cent.) which constitute the greater portion of commercial work. In such a case, annealing according to ordinary mill schedule would result in a rejection of about 30 per cent. But laboratory research will

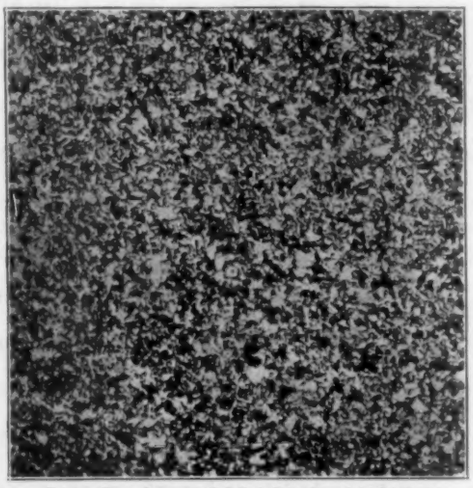


FIG. 5 AN EXCESSIVE AMOUNT OF IRON IN BRASS RETARDS THE GRAIN GROWTH. NOTE SMALL CRYSTAL SIZE MAG. 75 X $NH_4OH$, $H_2O_2$

readily determine the proper annealing temperature range, and the mill then can operate on such a schedule as to meet the specifications with ease.

A few typical instances where your laboratory has cleared up some mysteries are the following:

Some time ago the casting shop complained that in melting a certain mixture of brass the metal spumed upon solidification, giving off gases which led to un-

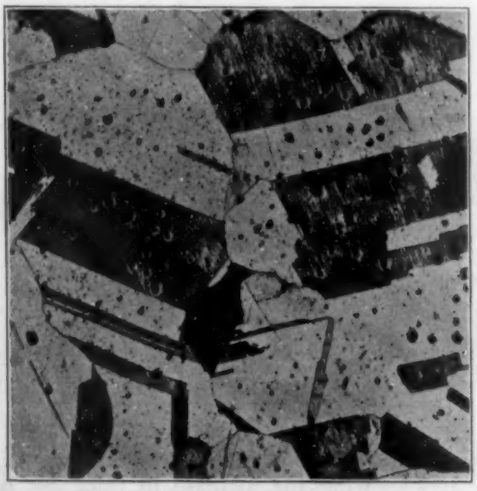


FIG. 6 BRASS SHELL WHOSE BOTTOM WAS PUNCHED OUT IN DRAWING. OVER ANNEALED. MAG. 75 X $NH_4OH$, $H_2O_2$

soundness in the cast bars. Laboratory investigation disclosed that a carload of underpoled copper which had been received was the cause of their trouble.

Occasionally the mill complains that one end of a bar will roll very easily, while the opposite end is so very hard that it breaks up in the rolls. Analysis and examination soon reveal that the offending bar has been produced from metal which has not been properly stirred, leaving one end of the bar high in copper and the other end low in copper. This condition is illustrated by Figs. 1 and 2.

Only recently it happened in the mill that two batches of brass—leaded and free from lead—on the same width and gauge became mixed. Samples from various bars were sent up to the laboratory and within one hour after receipt of the samples, the various bars were classified and the tangle was straightened out. Fig. 3 shows the appearance of lead, in an annealed brass. The black dots are lead. When brass is free from lead these black dots are absent—hence the ease of separating a leaded mixture from a non-leaded one without resorting to analysis.

Again, on some rare occasion, the mill runs across a bar of metal which persists in remaining hard, no matter how it had been annealed. Analysis usually shows that the particular bar contains an excessive amount of iron which hardens the metal and retards the grain growth. Such a condition is illustrated by Figs. 4 and 5.

Redrawing room is apt to encounter shells of which

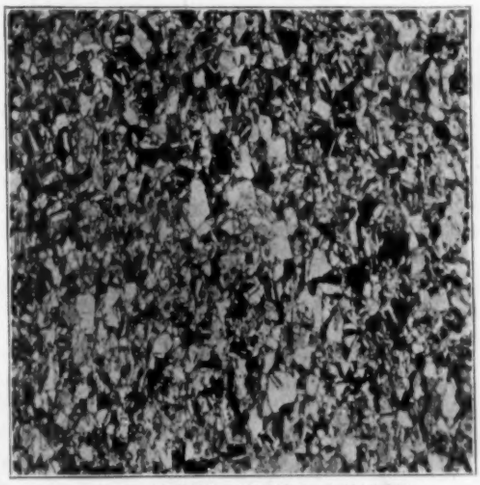


FIG. 7 BRASS SHELL WHOSE BOTTOM WAS PUNCHED OUT IN DRAWING. NOT SUFFICIENTLY ANNEALED. MAG. 75 X $NH_4OH$, $H_2O_2$

the bottoms push out during the drawing operation. Often this condition is a result of improper annealing, which can be readily detected under the microscope. This is illustrated by Figs. 6 and 7. Of course, with this knowledge, a foreman can soon remedy the defect.

The use of material unsuitable for the operations involved in the article to be made would result in a heavy loss. Suppose, for example, that during a heading operation a very large amount of the material fails and an analysis of the defective material shows that the wrong alloy is being used for that particular job, what conclusion should be drawn? Surely, that the safe method is to consult the laboratory before ordering the material.

One of the chief functions of the laboratory is control work. Samples are frequently taken from various heats of metal and analyzed in order to find out if the metal is being cast according to mixture. In the same way samples of annealed metal are submitted daily for microscopic examination and physical testing in order to find if the metal is being annealed uniformly and according to specifications. Besides this, of course, numerous

analyses are made of coal, oils, soaps, greases, chemicals, etc., to learn if they meet our own specifications.

Aside from the fact that the laboratory is useful in controlling our mixtures, heat treatment, etc., it has still another function, which is that of supplying data which may be helpful in planning or laying out a job. For example, if a customer desires metal in accordance with a certain sample which he submits, it is possible, by means of a chemical analysis, microscopic examinations and temper tests, to tell quite accurately which alloy and temper to furnish the customer and meet his requirements. On new orders for sheet metal the mill sends the customer's sample to the laboratory and does not guess at the customer's needs. All departments are in a position to take advantage of the same service.

When a customer submits a sample of an article which he wishes us to manufacture for him, it is advantageous to know beforehand the alloy and temper of the finished article, which can be revealed by chemical analysis and a careful examination under the microscope, but risky to rely entirely upon the ordinary visual examination.

In cases where a department wishes to learn the cause of defective material, the best way to proceed is to send to the laboratory several samples of the defective articles, together with several samples of good articles, so that a comparison can be obtained, and it assists materially in getting out an accurate and quick report if a clear history of the operations is included, together with a statement of the nature of the complaint.

Although the laboratory does not profess to be the cure-all for every industrial ailment, it is felt that with the co-operation of the various departments, there should result better control of the product, and consequently greatly reduced losses.

## STRUCTURAL CHARACTERISTICS OF ROLLED SHEET BRASS

SOME NOTES ON THE APPLICATION OF METALLOGRAPHY TO THE NEEDS OF THE ROLLING MILL.

WRITTEN FOR THE METAL INDUSTRY BY H. A. EASTICK. PART II AND LAST.

Fig. 5 shows the curve obtained by rolling sheet brass to various degrees of hardness and making physical tests on the specimens, and plotting the physical tests against the percentage reduction in thickness, which is a measure of the degree of cold work which has been performed on the metal. Examination of this characteristic curve shows the cumulative hardening effect of cold work.

The phenomenon of hardening up due to cold working

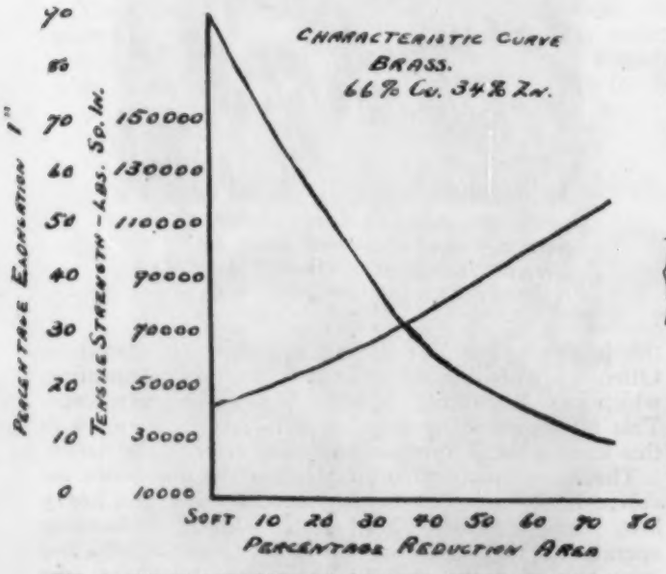



FIG. 5—CURVE OBTAINED BY ROLLING SHEET BRASS TO VARIOUS DEGREES OF HARDNESS.

is common to all metals, and it is proper at this point to examine into the causes of such a peculiar change. In this connection the microscopic examination throws considerable light on the subject and we have seen the development of slipbands, which appear in crystals when the elastic limit of the metal has been exceeded.

Beilby's theory of the hard and soft states in metals assumes the existence of an amorphous phase in metals. This phase is presumed to be a brittle vitreous substance similar to glass in its general properties. Taking an annealed crystal structure and performing cold-work upon it, is supposed to cause the crystals to slide over one another with the resulting formation of the vitreous material; the more severe the strains set up, the greater the quantity of the amorphous phase that is formed. Theoretically this process can proceed until the metal consists entirely of the amorphous phase and when this point is reached, the material possesses a maximum hardness with, theoretically, no ductility.

After the metal has reached its maximum degree of hardness it is impossible to perform further cold-work upon it without cracking; the reason for this may be explained by examination of Fig. 6. This diagram illustrates the formation of the amorphous material by crystals slipping one over the other.

a Represents two unstrained crystals.

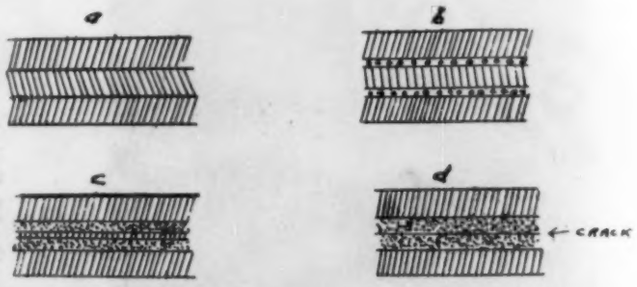



FIG. 6—SHOWING THE FORMATION OF AMORPHOUS MATERIAL BY CRYSTAL SLIP.

b Represents these crystals after being slightly strained, and showing the increase in thickness of the band of amorphous material between the crystals.

c Shows these bands to have increased in thickness by further slipping.

d Shows the bands to have increased in thickness to such an extent that all the crystalline material has been used up, with the result that upon further cold-work a crack has developed.

Upon annealing a strained structure; i. e., a metal consisting principally of amorphous material, the amorphous phase disappears with the formation of an entirely new set of crystals. The softening effect of annealing being,

therefore, entirely due to the disappearance of the hard vitreous phase.

Bearing these considerations in mind, therefore, we may consider the process of annealing metals in order to soften them as being a process of heating metal in order to impart sufficient mobility to the particles of the metal

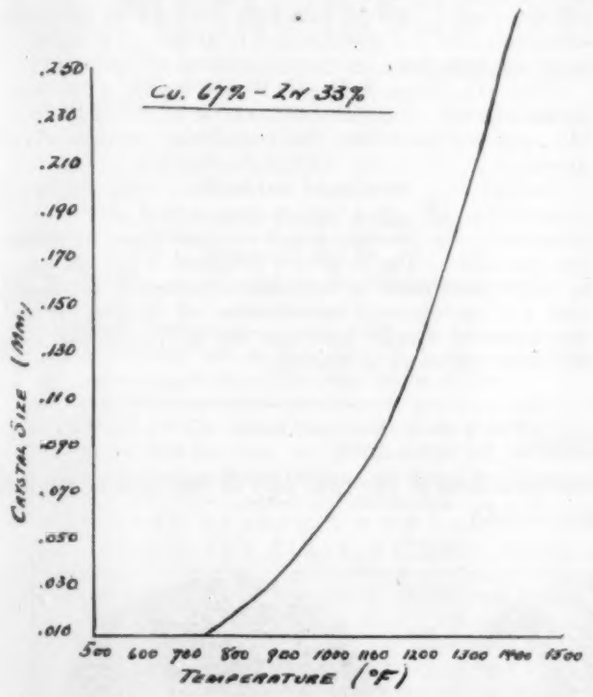



FIG. 7—CRYSTAL SIZE OBTAINED BY ANNEALING SHEET BRASS AT VARIOUS TEMPERATURES.

to enable them to recrystallize from the vitreous state. The temperature at which the recrystallization takes place varies considerably for different metals. Naturally, those having the lower melting points crystallize at a generally lower temperature; but for any given metal, the higher the state of strain under which the metal is, the lower the temperature of recrystallization. This is in accord with the principle governing all changes of state in matter whereby the nearer it is to an equilibrium, the more energy is required to actually bring it to the state of equilibrium.

Metal in the state of strain resulting from cold-work is not in equilibrium and the more cold-work which has been performed upon it, the further it is from being in equilibrium, with the result that the less energy in the form of heat is required to change its state.

Mention has been made of the fact that in the absence of eutectics, or metals not in solution, in a metal or alloy, that the force of cohesion was greater between the individual crystals than the strength of the crystals themselves. For this reason metals consisting of very small crystals are uually stronger than those with large crystals, and this difference is especially noticeable in the same metal having different crystal sizes; i. e., if we take a piece of brass consisting of small crystals and another which has been annealed at a very high temperature and, therefore, has very large crystals, we find that the metal having the fine crystalline structure has very much more strength than the metal with the coarse structure. It is easy to see that the reason for this difference is that the metal with the fine crystals has considerably more boundaries than the coarse structure and inasmuch as the force of cohesion is proportional to the area of the surface in contact, the metal as a whole is stronger.

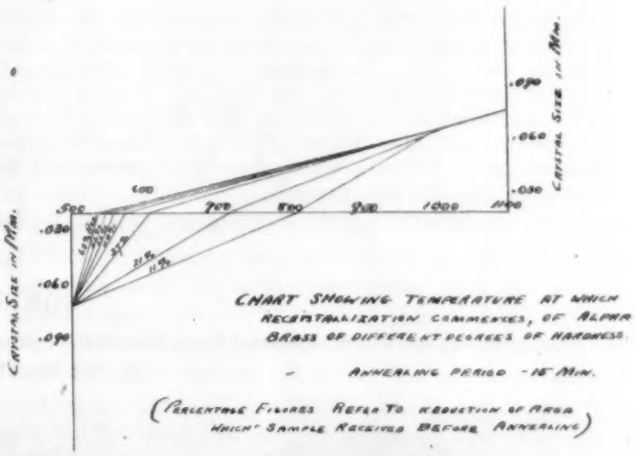

Crystal Size in Mm.
.090
.060
.030
500 600 700 800 900 1000 1100
Crystal Size in Mm.
.030
.060
.090
Chart Showing Temperature at which Recrystallization commences, of Alpha Brass of different degrees of hardness.
Annealing Period - 15 Min.
(Percentage Figures Refer to Reduction of Area which Sample Received Before Annealing)

FIG. 8—CHART SHOWING TEMPERATURE AT WHICH RECRYSTALLIZATION COMMENCES, OF ALPHA BRASS OF DIFFERENT DEGREES OF HARDNESS.

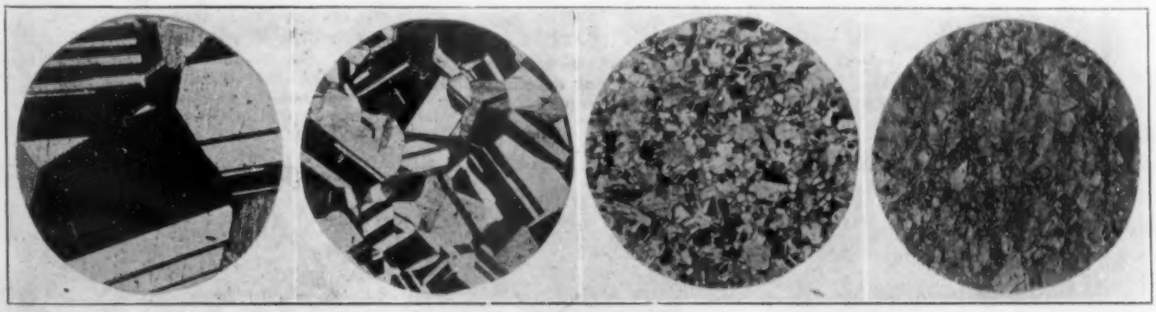


PLATE III.

Fig. 7—Annealed Brass, Showing transformation of old strained structure.

Fig. 8—Annealed Brass. Temperature of Anneal 1,000° F.

Fig. 9—Annealed Brass. Temperature of Anneal 1,250° F.

Fig. 10—Annealed Brass. Temperature of Anneal 1,450° F.

As is well known, the size of crystals of alpha brass increases with the temperature of the anneal. A comparative measure of the temperature of anneal is the size of the crystals. Crystal size is determined by projecting the image onto the ground glass screen which is ruled off into a series of squares, each of which is one square millimeter, magnified to the same extent as the magnification afforded by the objective and eye piece of the microscope, and the extension of the bellows of

the camera. In commercial practice, it is quite common to specify metal to have a certain crystal size, which is the most desirable way of specifying metal to be of a certain anneal.

Fig. 7 shows the crystal size obtained by annealing sheet brass at various temperatures. It will be noted that the size is expressed as so many millimeters. The usual magnification for the examination of brass and copper, is 75 diameters.

Mention has been made of the fact that the higher the state of strain under which a metal is, the lower the temperature of recrystallization. Fig. 8 is a chart showing the temperature of recrystallization of a series of samples of sheet brass which have been rolled to various degrees of hardness as expressed by the percentage reduction of area. The temperature of recrystallization is that temperature at which the original strained crystal structure commences to break up into the new growth of very minute crystals. Plate III., Fig. 7 shows the structure of strained brass which has just commenced to transform into the new growth.

It will be observed from the diagram in Fig. 8 that at a temperature of approximately 1050° F. the same crystal size is obtained regardless of the degree of strain under which the annealed metal existed. Bearing in mind what has been said above in regard to the general effect of small crystals on the mechanical properties, it would appear that the most desirable temperature at which to anneal brass is 1050° F., inasmuch as this is the temperature which insures complete removal of the original structure, and it is unnecessary to anneal at a higher temperature than this.

Plate III., Figs. 8, 9 and 10 are typical structures of annealed brass. Fig. 10 shows extraordinarily large crystals and indicates that the metal was very much over annealed.

Enough has been said to indicate that microscopic examination affords a very useful method of checking up manufacturing processes, and in some cases, it is almost indispensable. The structure obtained is greatly affected by slight variations in the various processes of manufacture and microscopic examination of failures or defective material usually indicates the nature of the trouble and also indicates a remedy.

## CORRECTION.

**[These photographs are repeated here because of some transpositions in the first part of this article published in the March issue.—Ed.]**

PLATE I.

Fig. 1—Lead-antimony eutectic (13 per cent antimony).

Fig. 2—Lead-antimony alloy (55 per cent sb.), showing crystals of antimony surrounded by eutectic.

Fig. 3—Lead-antimony alloy (8 per cent sb.), showing crystals of lead surrounded by eutectic.

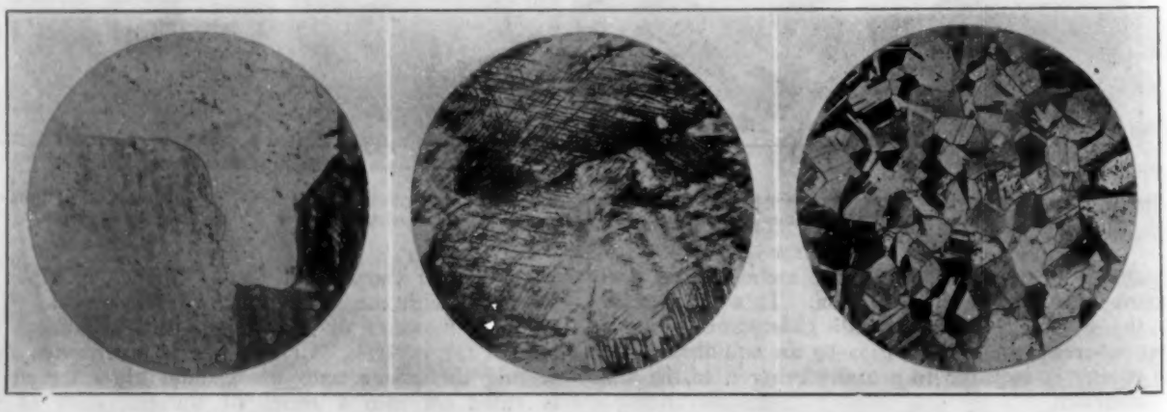


PLATE II.

Fig. 4—Cast Brass (67 per cent copper).

Fig. 5—Cast Brass (67 per cent copper). Same as Fig. 4, after cold rolling.

Fig. 6—Annealed Brass, 67 per cent copper, same as Fig. 5, after annealing at 1,100 degrees Fahr.).

# EDITORIAL

Vol. 17 New York, April, 1919 No. 4


# THE METAL INDUSTRY

With Which Are Incorporated
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## CONTENTS


| | Page |
|---|---|
| Metallurgical Furnaces | 159 |
| National Association of Waste Material Dealers | 163 |
| Electro-Plating on Iron from Copper Sulphate Solution | 164 |
| Remarkable Pitting of Electro-Plating | 166 |
| The Hardening of Aluminum Bronze | 167 |
| A Practical White Metal Melting and Casting Machine | 168 |
| A Departure in Rolling Mill Casting Shop Practice | 169 |
| Etching Solutions and Their Uses | 170 |
| Melting Points of Chemical Elements | 171 |
| The Bending and Forming of Brass Rod and Tubes | 172 |
| Relations of Laboratory Researches to Mill Practice | 174 |
| Structural Characteristics of Rolled Sheet Brass (concluded) | 176 |
| Editorials: | |
| Germany's Metal Octopus | 179 |
| The Victory Loan | 180 |
| Correspondence and Discussion: | |
| Is Casting Cymbals a Lost Art? | 181 |
| Appreciation | 181 |
| New Book: | |
| The Journal of the Institute of Metals | 181 |
| Shop Problems | 182 |
| Patents | 184 |
| Equipment: | |
| A Pyrometer for Brass and Bronze | 186 |
| Electric Baking of Cores, Japans and Enamels | 187 |
| A New Conveyor | 188 |
| A Patented Auxiliary Hoist for Traveling Cranes | 189 |
| How Germany Lost Our Bronze Powder Business | 189 |
| Die Stock and Pipe Cutter | 189 |
| Associations and Societies | 190 |
| Personals | 192 |
| Trade News | 195 |
| Metal Market Review | 203 |
| Metal Prices | 204 |
| Supply Prices | 206 |


## GERMANY'S METAL OCTOPUS

The German metal octopus which had clutched in its tentacles North and South America and Mexico is no more. The method of its formation and the news of its passing are given in a most interesting report just made by A. Mitchell Palmer, Alien Property Custodian to President Wilson. The story of the German octopus is told in Chapter Three under the title of THE METAL SITUATION.

"To appreciate what has been accomplished in ridding the metal industry of the United States of the influences of the so-called 'German metal octopus,' it is necessary to briefly sketch the growth of the German metal concerns on their native soil, and then to point out how these gradually invaded foreign markets and to what extent the American metal markets came under their domination. At the outset, however, it must be pointed out that however much justification there is for the assertion that the German metal combine controlled the metal markets of Europe and Australia—especially in zinc and lead— it is not the fact that they controlled the metal market of the United States. Their influence here was potent, no doubt, and it was growing, but it was far from sufficient to control either the production or the price of metals in the United States. The octopus was spreading his tentacles across the Atlantic, but he had not yet assumed the 'octopian' proportions.

"The Alien Property Custodian has taken over the German-owned metal concerns in the United States, and, by disbanding some and Americanizing others, it is believed that the German influences in our metal market have been completely eliminated.

### GROWTH OF THE GERMAN METAL TRADE.

"Germany has never been a great producer of metals. Her production of copper is but 3 per cent.[1] of the world's output, against about 60 per cent. produced by the United States. Her production of refined zinc is about 28 per cent. of the world's output, and of lead she produces 16 per cent. of the world's total production. Yet unquestionably Germany has for years controlled the zinc and lead metal markets of Europe and of the rest of the world except the United States. What is the secret of her power? It is not alone that she is a large consumer of metal. For though she consumes annually about 500,000,000 pounds of copper more than she produces, she consumes only 23 per cent. of the world's zinc against her own production of 28 per cent. of the world's output; and of lead she consumes only 20 per cent. of the world's output against her own production of about 16 per cent. Yet she completely controls the zinc and lead markets of the world. The secret of her power lies in the fact that her great metal firms act in concert in the purchase of zinc and lead ores, co-operate in the control of smelters and refineries, and by the free use of unlimited credit extended to them by the German banks, who themselves

[1]All figures herein regarding Germany are for 1913.

participate in these industrial enterprises, they are enabled to buy and sell huge quantities of metals, thereby influencing the market prices.

THE GERMAN METAL TRIUMVIRATE.

"There are but three great international metal concerns in Germany—the Metallgesellschaft of Frankfurt, Aron Hirsch & Sohn of Halberstadt, and Beer, Sondheimer & Co. of Frankfurt. These giant organizations, whose operations now circle the globe, are of comparatively recent development and are the growth of very small and humble beginnings.

"Around the year 1800 there were in Germany three small concerns or individuals devoting themselves to the metal business, viz., Jacob Raviné, Berlin; Philip Abram Cohn, Frankfurt; Aron Hirsch, Halberstadt. They traded in the products of the country—lead produced in the Hartz Mountains or in Saxony or Silesia, copper produced by the Mansfield Works and other small concerns, and they also brought in some copper from Sweden.

"In the nineteenth century the three concerns developed on somewhat different lines: Raviné drifted more into the iron business; Cohn developed into a very large metal merchant, and Hirsch developed into a combination of industrial manufacturer and metal merchant.

"(1) The Metallgesellschaft is the largest of these concerns and is by far the most powerful metal concern in the world. It is a stock corporation with a capital of 18,000,000 marks. It is the outgrowth of the metal business founded by Philip Abram Cohn early in the nineteenth or late in the eighteenth century. In the early sixties of the last century, Henry Merton, whose real name was Moses and who was related to Philip Abram Cohn, founded a metal firm in London which later became the powerful house of Henry R. Merton & Co. (Ltd.). The Metallgesellschaft and the Merton firm worked hand in hand for the advancement of German domination of the metal markets of the world.

"(2) Aron Hirsch & Sohn, a copartnership, is the business founded by Aron Hirsch and it has always been kept in the Hirsch family. This house has not confined itself strictly to metal trading but has also engaged in metal manufacturing. It has interests all over the world.

"(3) Beer, Sondheimer & Co., a copartnership, was founded in the latter part of the seventies by Messrs. Beer and Sondheimer, two salesmen of Metallgesellschaft, who broke away from the Metallgesellschaft and with the assistance of the Mitteldeutsche Credit Bank started in business for themselves under the name of Beer, Sondheimer & Co. This firm has confined its activities principally to the zinc smelting business.

"The Federal Trade Commission in its Report on Co-operation in American Export Trade issued in 1916 has included a very excellent chart, showing the interrelations between the German metal houses. This has been used as a basis for the charts annexed to this report which have been brought down to date according to the latest information available, and which show the ramifications of the German metal combine. We find in their control not only German metal and chemical companies, but also French, Belgian, English, Australian, American, Swiss, Austrian, Italian, Spanish, and Mexican. In addition they control syndicates for the exploration of mines in South America, Hungary, Russia, and on the African Continent. In this vast combine we find charted 245 separate companies whose interests lie in almost every part of the globe and who produce every known form of mineral."

The report gives very completely the history of these concerns and recites their activities in the American metal markets and then closes with the following summary:

THE RESULT.

"To summarize the result of the activities of the Alien Property Custodian in so far as they affect German interests and German influences in the American metal market, it may be said that finding those interests and influences centered in three well-defined corporations, American in name, but all controlled by the German metal triumvirate, the activities of which three corporations were not confined solely to the United States but penetrated into Mexico and South America, owning mines, smelters, refineries, oil concessions, railways, dealing in every known metal, doing a business which annually ran into hundreds of millions of dollars, he has succeeded in thoroughly Americanizing two of these concerns and liquidating the third, thereby entirely eliminating German influences in our metal markets and our metal industry.

"The German metal octopus had spread his tentacles across the ocean and over the United States into Mexico and South America, but for the present surely, and for all time it is hoped, he has been driven back and a wall of Americanism erected which, it is hoped, he will never be able again to scale."

## THE VICTORY LOAN

The fifth loan to be placed by the United States Government to cover the cost of the war will be called the VICTORY LOAN. The drive for subscriptions for this loan will begin April 21 and close on May 10th, 1919.

Subscription to the VICTORY LOAN is not merely a discharge of the duty we owe our fighting men. It is a definite aid in bringing about good business conditions, which mean OUR OWN PROSPERITY.

If this loan is not taken by millions of the American people—if we leave the banks to take it—America must suffer the consequences. The banks cannot take up a loan of several billions and still lend money at a fair rate of interest and in sufficient quantities to meet the present needs of American business. And if credit facilities adequate to take care of the needs of business are lacking, we cannot take advantage of the present great opportunities for commercial growth and development. Instead of the prosperity that we might have, we shall have industrial depression, unemployment and general hard times.

A failure by business men to work as intelligently and determinedly for a widespread distribution of this loan among their employees and associates as they worked in the previous Liberty Loan campaigns, will result in a detriment to business which cannot fail to react to the hurt of themselves, their employees and the public in general.

Every employer should welcome and gladly avail himself of this chance for the further education of his workmen. It is a chance to develop and increase the realization that co-operation, mutual respect and patriotic unity in effort alike of employer and employee are the ONLY sure means by which industrial and commercial peace and enduring prosperity for all can be secured. Continued unity in the support of the Government is the greatest safeguard of American business today.

# CORRESPONDENCE AND DISCUSSION

**While we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.**

## IS CASTING CYMBALS A LOST ART?

"Though I speak with the tongues of men and of angels and have not charity I am become as sounding brass and a tinkling cymbal."—1st Corinthians 13—1.

**[The March issue of THE METAL INDUSTRY contained an article and an editorial relative to the state of the art of casting of brass cymbals in this country. THE METAL INDUSTRY acting upon information received from Messrs. Ludwig & Ludwig, of Chicago, Ill., asked the brass foundry industry what they thought about the future of cymbal making in the United States. The following letters, we believe, will go far in setting at rest the fears that cymbal casting may become a lost art.—Ed.]**

To the Editor of The Metal Industry:

In the March issue of The Metal Industry on page 129 there is an article regarding "Casting Cymbals." We note that the Ludwig & Ludwig Company, drum makers, of Chicago, requested some information on how to cast cymbals, fearing that this art will be lost. I do not understand why they think this art would be lost. I have written them that I am going to manufacture the highest grade Turkish cymbals here in America, and I have also written to all the leading houses in this respect, and I wanted to send sample cymbals, but conditions changed. After I finished my samples I submitted them to the best leading drummers and band masters. They all stated that I have the best cymbals they have ever seen in this country, and they were surprised at the high pitch and sonority of them. Now we are manufacturing them on a larger scale, and Rudolph Wurlitzer Company of Cincinnati is our sole agent, and all those interested in this famous cymbal should make inquiries regarding them direct to Wurlitzer company as our annual product is purchased by them.

"There is no fear that this art will be lost." All I will say is that our cymbals will be superior to the Ziljian, Constantinople make—both in appearance and in highest musical vibrations.

K. Kazanjian & Co.,
Buffalo, N. Y., March 24, 1919. Per K. M. K.

---

To the Editor of The Metal Industry:

I have read what you have to say in regards to making cast cymbals and if you can put me in touch with the parties who wish them in any quantities and are willing to pay a fair price for making them I believe I can furnish them all they require. The bad feature of such work in the past has been that we could not compete with the foreign market, and in order to perfect such work it required considerable outlay which would not pay. However, they do not cast anything in Turkey which we cannot produce in the United States of America. If they wish to produce them by the pound at the rate of ordinary brass castings, I would not be interested.

Battle Creek, Mich., March 21, 1919. W. G. Jones.

---

To the Editor of The Metal Industry:

In reading your article in the March issue of The Metal Industry, reference to casting cymbals, would say that I can cast these cymbals, but the only thing that troubles me at this time is the heat treating of same. Would be pleased if you would look into the heat treating of the cymbals and advise me what treatment to use to get the proper temper for the cymbals.

Would also like to know if there is enough business of this nature to warrant an incorporation of a company to promote this work. Kindly advise in regard to cymbals, also parties that we can get in touch with who are in the market for this class of goods.

Sellersville, Pa., March 19, 1919. Wm. Hill.

---

To the Editor of The Metal Industry:

I read in The Metal Industry the article on the "Lost Art of Making Cymbals," and believe that if you can put me in touch with any firm that is using them that I will be able to make them as good as any they ever got from Turkey.

Gasser Brass Foundry.
511 Sante Fe, Denver, Col., March 24, 1919.

## APPRECIATION

To the Editor of Metal Industry:

I am sending you these few lines as an expression of the interest I take in your magazine. This is my first year on your list of subscribers and I hope it won't be the last. Wishing you every success.

The Metal Industry
Without my Metal Industry
I surely would be lost
Like a ship without a rudder
Upon the billows tossed.

Of late I've just begun
Its pages o'er to pore,
But like the welcome rain from heaven
I'm going to pore some more.

I read its contents monthly,
With knowledge more renewed;
I tell my colleagues bluntly,
In a style that may seem rude,

That if they in their craniums
Have some useful matter stored,
Just send it to the Editor,
He'll note it word for word.

The ads alone are worth the price
Of this book for a year;
It tells you of equipment made
On this terrestrial sphere.

So here's good luck to the readers and staff
Of The Metal Industry,
May the year —19 which has just begun
Prove a prosperous year for thee.

John Shering.
Niagara Falls, Ont., Canada.

## NEW BOOK

**"THE JOURNAL OF THE INSTITUTE OF METALS," Volume XX, 382 pages and 19 plates. Edited by G. Shaw Scott, M.Sc., and issued by The Institute of Metals, 36, Victoria street, London, England. Price $5.00.**

Though essentially a record of a series of meetings held in wartime, the twentieth volume of the Journal of the Institute of Metals makes a post-war appearance and will be found, appropriately enough, to include valuable metallurgical information relating both to war and to peace.

A special feature of the new volume is the illustrated May lecture, on "The Formation of Diamond," which was delivered before the Institute by the famous inventor of the steam turbine, the Hon. Sir Charles Parsons, and of which the publication has been eagerly awaited by those intrusted in the various branches of applied science that Sir Charles called to his aid in carrying out his classic experiments on diamond formation.

Thirteen other communications, covering a wide range of subjects of metallurgical interest are included in the Journal. One of these—that on "The Use of Oil Fuel in the Foundry"—was written at the front by a member of the Institute of Metals. Two others, dealing with grain growth in metal, and the annealing of aluminum sheet respectively, are contributed by American metallurgists, the remainder being devoted largely to copper, brass, bronze, and laboratory problems—the work of well-known British men of science.

The volume concludes with some hundreds of concise summaries of the world's metallurgical publications during the past half year and a very complete index.

# SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

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## CASTING

Q.—We are interested in the possibilities of die castings and would like to obtain the following information. Is it possible to make iron die castings using present methods? If not what is the highest iron contents possible in die castings as we know them today? Do you consider an iron die casting a commercial possibility?

A.—As far as we know there is no process in commercial operation for making die castings in iron. The steel die molds oxidize at the temperature necessary for melting the cast iron and no substitute for steel that is satisfactory has been found.

So-called die castings are being made by several firms in the United States from an iron-aluminum-copper alloy as high as 15 per cent. iron, having been used. The molds are of steel and they are poured by hand just like sand molds. The molds are opened and the castings removed by mechanical means, the process in these respects resembling the present die casting process. Die castings in cast iron are said to be made in Germany by this process.

A number of years ago castings were made from cast iron in permanent molds by the so-called "Custer" process. Enough work has been done on this subject to indicate that both die cast iron and die cast steel are commercial possibilities. The chief obstacle is the lack of a high melting point alloy for the die molds.—J. L. J. Problem 2,683.

Q.—I am having trouble casting leaded brass (copper 64, lead 1½ and zinc 34½) in molds 12 by 2 by 24 inches. Cracks appear on the surface of the bar. The metal is annealed before rolling, but the cracks do not show up until the bars come back from the annealing. I do not have any trouble in casting narrower bars. Do you think the trouble is due to fire cracking as I have found that the cracks are mostly on the upper side of the bar. Do you think the mixture I am using suitable for this class of work?

A.—We believe that the trouble with the wider bars may be due to some inequality in the molds. Have you tested them to see if one side of your bar does not come wider than the other? It sometimes happens that a mold will furnish a bar of this character and then due to the uneven pinching in the rolls cracks will result. It is possible, too, that if the mold is a box mold and the pins do not hold it sufficiently tight the fins which are formed on the upper side of the bar produce minute hair cracks when the fins are filed off.

We believe that there must be something of this nature the matter as there should be no difficulty in making your bar of the mixture that you specify. It is possible also that the thickness of the bar would require a bit more crown than you have on it, although the general practice in rolling mills is to have an eighth of an inch crown but the metal is usually only 1¼ inches thick.

If it is found that there is no mechanical trouble which causes the cracks they then may be traced to the annealing process, but due to the fact that the narrow bars roll all right makes us believe that the cause lies in the molds.—K. Problem 2,684.

Q.—We are asked to supply nickel alloy castings for the seats of stop valves to withstand high-pressure superheated steam. We assume the pressure would be 250-300 pounds, and understand this metal is being used by numerous valve makers up and down the country for this purpose. We shall be glad to know the composition of the alloy, the method of casting the metal, and information as to its machining.

A.—An alloy similar in composition to "Monel" metal would be suitable, containing:

| | |
|---|---|
| Nickel | 64 — 65 |
| Copper | 33 — 34 |
| Iron | 2 — |

To make such an alloy, a very high temperature is necessary in order to melt the nickel. The copper and nickel should be charged into a white-hot crucible and a flux of powdered glass or calcined borax added. When melted add 2 or 3 per cent. manganese (as cupro-manganese containing about 25 per cent. manganese). Iron may be introduced as good wrought iron or by using an alloy made from ferro-manganese and copper. If these are first melted together in equal parts, using a ferro-manganese containing 80 per cent. manganese, the resulting alloy will contain about 40 per cent. manganese, 50 per cent. copper, and the balance mainly iron. By adding this alloy to the molten mixture of copper and nickel, a good casting alloy should be obtained. The addition of about 0.1 to 0.2 per cent. vanadjum or titanium (in the form of cupro-vanadium or cupro-titanium) should help to produce sounder and more homogeneous castings. Try the following proportions:

| | |
|---|---|
| Mond nickel | 66% |
| Copper | 28% |
| Copper, manganese, iron alloy | 5% |
| Cupro-titanium or cupro-vanadium | 1% |

Add the cupro-vanadium when the crucible has been withdrawn from the furnace and stir thoroughly before pouring. This alloy should machine, but will probably be rather rough, if well made. —W. T. F. Problem 2,685.

## COLORING

Q.—We are having trouble with our name plates. There seem to be surface scratches and after silver plating these scratches seem to show up and the finish has more or less a gray appearance.

A.—The surface scratches on your name plates must be due to the final coloring. Either your buffs are accumulated with small particles of the polishing material which causes the scratches or your polishing material is too coarse in grade.

We would suggest that you try for the final finishing the finest lamp black and kerosene oil, using very soft buffs, then wipe on canton flannel buffs run at 800 to 1,000 revolutions per minute. Use jewelers' fine gold rouge mixed with denatured alcohol and apply a little to the canton flannel buff with a brush or swab. Also keep your buffs well combed out to keep the dirt from accumulating in them.—C. H. P. Problem 2,686.

## COPPERIZING

Q.—We would like a formula for a material for copperizing the surface of iron and steel. This material is used to mark out where the article is to be drilled or machined.

A.—The copperizing of iron or steel surfaces can be accomplished satisfactorily by applying with a rag or sponge a slightly acid solution of blue vitriol and water. When the liquid evaporates a copperized surface results. The solution can be mixed up in quantities and kept in a stopper bottle. The stronger the vitriol solution is used the heavier the copperized surface will be.—P. W. B. Problem 2,687.

## DIPPING

Q.—Can you advise us of a formula for a solution into which ground pocket knife blades can be dipped to prevent their rusting. We have been using slacked lime for this purpose, but the dust which comes from the lime makes this method unsatisfactory.

A.—We would suggest that you try the two following methods. After immersion in the solution for a second or two the knife blades should be removed and allowed to dry either by the aid of a gentle heat or in a warm room and

when thoroughly dry exposed to the atmosphere where they will come in contact with moisture and you can note which method gives the best rust free coating after such exposure for several days.

Method No. 1.

| | |
|---|---|
| Phosphoric acid .78% | ½ pint |
| Denatured alcohol | 1 pint |
| Carbon tetra chloride | ¼ pint |

Method No. 2.

| | |
|---|---|
| White French Varnish | ½ pint |
| Fusel oil | ½ pint |
| Amyl acetate | ½ pint |

This latter solution is practically a varnish lacquer and it can be further diluted if the coating does not show rainbow colors after being applied to the polished blades.

A third method would be to immerse in a mixture of paraffin wax and paraffin oil in the proportions of 1 part of wax to 3 parts of oil. Heat to about 180 degrees and immerse the blades in the mixture for a second and then allow to cool. A waxed tissue should always be used for wrapping up the finished product as it prevents moisture reaching the steel.—C. H. P. Problem 2,687.

## FINISHING

Q.—We would like to get a formula for an imitation platinum solution which we understand is being used extensively.

A.—Imitation platinum solutions are either nickel or tin and are termed Platinoid Finishes. The tin solution is prepared as follows:

| | |
|---|---|
| Water | 1 gallon |
| Sodium cyanide | 1½ ounces |
| Tin chloride crystals | 1 ounce |
| Caustic soda | ¾ ounce |
| Soda ash | ½ ounce |
| Common salt | ½ ounce |

Use the solution at a temperature of 160 degrees, the anode being a small sheet of rolled nickel about 1/32 inch thick.

The nickel solution should be prepared as follows:

| | |
|---|---|
| Water | 1 gallon |
| Double nickel salts | 2 ounces |
| Single nickel salts | ½ ounce |
| Boracic acid | ½ ounce |
| Sal ammoniac | ½ ounce |
| Epsom salts | ¼ ounce |

This solution should be used at 120 degrees Fahr. with sheet nickel anodes. If the deposit is too rapid reduce still further with water. In producing imitation platinum finishes the aim is to obtain a bright and white finish as rapidly as possible as in gold plating. It is possible to polish the finish so obtained with soft buff wheels and a fine white coloring composition.—C. H. P. Problem 2,688.

## MIXING

Q.—Have you any information regarding the mixing of antimonial lead? We are experiencing difficulty in pouring, the metal being lumpy and thick.

A.—You should not experience much difficulty in mixing antimonial lead if you do not aim to make an alloy of more than say 12 to 15 per cent. of antimony. As antimony is much more susceptible to oxidation than lead it is possible, if your compound is lumpy and thick, that this is due to antimonial oxide which has been formed. The best method to pursue is to melt the lead and bring it up to practically boiling, keeping it well covered with some form of slag and then mixing in gradually and carefully the antimony broken to very small pieces, and thorough stirring with a wooden stick will give a good product. The metal should be cast as soon as possible after being mixed.—K. Problem 2,689.

## OXIDIZING

Q.—I would like to know of a process for relieving oxidized copper surface on steel. At present I copper the steel in the usual way and then oxidize with sulphuret of potash. For relieving I use a cloth mop charged with tripoli, but this does not give good results. For instance, it leaves a greasy deposit and also removes the copper coating in places and shows up the steel.

A.—No doubt the trouble with your oxidized copper finish on steel is due to the thinness of the copper deposit or the sulphuret of potassium is used too strong which has a tendency to absorb the copper, producing a copper sulphide which would reduce the thickness of the copper deposit applied.

We would suggest therefore that a sufficiently heavy deposit of copper be obtained on the articles, then immerse in a hot solution of sulphuret as follows:

| | |
|---|---|
| Water | 1 gallon |
| Sulphuret of potassium | ¼ ounce |
| Ammonia water | 10 drops |

Instead of using tripoli as a medium for removing the copper sulphide or oxide use a cloth buff or felt wheel run at a speed of 800 to 1,000 revolutions per minute. As the abrasive use pumice stonce in powder form mixed with a little sweepings from a flour mill and then mixed with water. Apply a little of the pumice stone mixture to the wheel and finish as usual.

To prevent oxidization of the relieved copper surface add a little cream of tartar to the water or better still a little soda ash to prevent rusting. Dry and lacquer in the usual manner. —C. H. P. Problem 2,690.

## PLATING

Q.—We are making a specialty of tin-ware brass plated. After scouring the tin, it is hung in the brass solution, then dried out and lacquered, but in about two months the article turns back to the original tin color.

A.—Apparently the brass plate is so very thin that it is absorbed by the tin. In other words, an electric action is set up between the two dissimilar metals. A thin deposit of nickel upon the tin will prevent the absorption of the brass deposit or a copper deposit will prevent this action.—C. H. P. Problem 2,691.

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Q.—I would like to gold plate some large brass dishes so that I could heat up nitric acid in same without the acid having effect on the brass.

A.—We would consider this a very impractical and expensive method of obtaining dishes for heating your acid. In the first place it would require a large amount of gold, and in the second place it would be almost impossible to gold plate these so as to make the dishes absolutely acid proof. We would suggest using ordinary crockery ware for the purpose you mention. The ordinary glazed crocks will last from six to twelve month for boiling acid. The expense of renewing the jars would be much less than the initial cost and up-keep of the gold plated dishes. If the nitric acid is to be used in small quantities, an ordinary Venetian flask can be used to good advantage.—O. A. H. Problem 2,692.

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Q.—Can you tell me whether there is such a solution as a rapid gold plating solution? What I would like to get is a solution that will give a heavy deposit of gold similar to that obtained from an acid copper solution.

A.—If you use an acid copper solution as a basis for heavy deposits and want to produce similar deposits in gold, then the gold solution will have to contain gold in relative proportion to the copper. A copper sulphate solution contains approximately 1¼ pounds of copper sulphate or equal to 7 ounces of metal per gallon of water. If you use less than one-third of the above proportions of metal in fine gold your solution would be an expensive one.

To obtain rapid deposits from any type of solution means a high metal content, and the solution should be used warm or hot. The only suggestion we can make that will be of any value to you in producing heavy deposits of gold is to increase the cyanide and gold content of the solution, so it will deposit more gold in less time than the ordinary gold solution. It will be necessary to use not less than one ounce of fine gold per gallon of solution. If this amount is increased then the deposit will be increased proportionately, for with more metal in solution greater amperage can be carried on a given surface, which means that more rapid deposits can be obtained.—C. H. P. Problem 2,693.

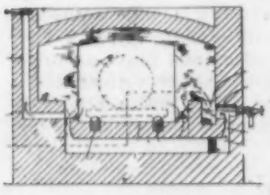
# PATENTS

## A REVIEW OF CURRENT PATENTS OF INTEREST

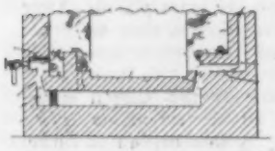
**The age of these patent notices is due to the delay in the issuing of patent reports.—Ed.**

1,289,547. December 31, 1918. **Heating Furnace.** G. S. Rockwell of New York, assignor to W. S. Rockwell Company of the same place.

This invention relates to that class of metal heating-furnaces which is especially adapted to the heating of large ingots, forgings, or other objects which should be subjected to heat equally upon all sides, to heat them through uniformly with the least delay.



Such furnaces may be made twenty or sixty feet long and can operate upon ingots, forgings, or other articles of such weight that they require a car for introducing them into the furnace and supporting them while heating.



The present invention furnishes means for introducing the flaming gases from liquid fuel-burners into different parts of the heating-chamber, as shown in cut, and to control their circulation through the bottom of the heating-chamber; also the egress of the spent gases therefrom at various parts of the chamber, whereby it provides means for equally heating the floor of the chamber and the bottom of the charge without locating a combustion-chamber beneath the floor, which would render the floor unable to support the heavy loads contemplated.

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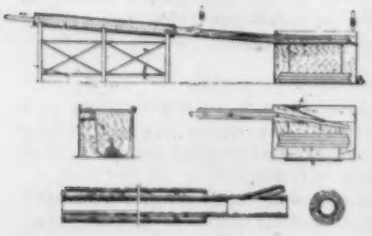
1,292,352. January 21, 1919. **Method of and Apparatus for Bright-Annealing Copper and Brass Tubes.** John A. Moorhead, Sewaren, N. J.

This invention has to do with the annealing of copper and brass tubes.

The present methods of annealing such tubes are slow and expensive. The apparatus required is more or less complicated and cumbersome, and the treatment and manipulation of the tubes during and after the annealing process proper involve considerable labor, time and outlay.



It has been found that all these objections may be in large measure avoided by providing as shown in cut, as the source of heat a powerful alternating current coil in the form of a long tube, through which, when properly constructed, the tubes may be progressively and continuously forced, in a non-oxidizing atmosphere, and thereby rapidly and perfectly annealed since they constitute a short closed secondary circuit for the primary coil which will raise them quickly to the proper annealing temperature. After the tubes issue from the heating coil they are immersed in a tank of water or other cooling liquid before they are permitted to meet an oxidizing atmosphere.

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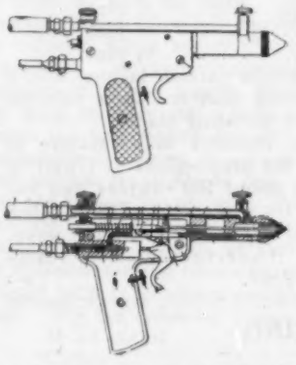
1,292,318. January 21, 1919. **Air-Brush.** Birchard E. Holton, Los Angeles, California.

This invention relates to air brushes and consists of the novel features herein shown.

One of the principal objects of the invention is to make a material tube for delivering the material to the point of the atomizer, the tube being removable and interchangeable, so that by manipulating a set screw a tube carrying one material may be removed, and another tube carrying a different material instantly applied.



Another object of the invention is to make an air brush, in which the air and material connections are both at the extreme rear end of the main head, and above the hand-hold, so as to avoid the trouble of having the hose connections dragging over the fresh work and causing it to be done over again.

Another object of the invention is to make a single trigger control for the air and material, and to provide adjustments so that the air will be turned on before the material is turned on, and so that the flow of material may be accurately regulated.

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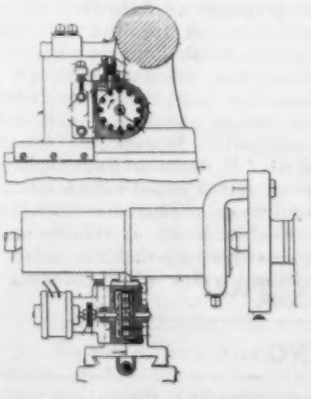
1,292,494. January 28, 1919. **Method of Cutting Metals.** Wm. A. Lorenz of Hartford, Conn.

This invention comprises a process of cutting metals, to be applied to lathes, planers and other metal working machines in order to enable them to obtain greater production.

In the present practice lathe and planer tools are fixed in holders and provided with proper cutting edges, the work being moved against the tool in order to remove a definite amount of stock. Such removal of stock or "cut" requires an excessive amount of power in proportion to the useful work done.



The improved process consists in imparting to the cutting tool, which is supported in the machine, as is shown in cut, a rapid succession of preferably minute impacts or percussive vibrations in order to drive the tool by very rapid and short successive advances into the approaching metal, while it is being cut.

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1,294,501. February 18, 1919. **Method and Machinery for Forming Strip Metal.** S. L. McCormick, Pittsburgh, Pa., and William F. Rese, of Warren, Ohio.

This invention relates to improvements in method and in machinery for forming strip metal. The method is accomplished in the operation of the improved machine; and the machine in its co-ordinated movement subjects the material to the working of the improved method.

The invention is applicable in the production of strips of metal of all sorts—copper, brass, aluminum, or of any other metal.

The machine is shown in the accompanying cut.

The slitter shown is a rotary slitter, and includes one and preferably two cylindrical bodies, one at least of which is pro-

vided with sharp-edged collars constituting rotary knives or cutters. These collars will preferably be removable and replaceable upon the cylindrical carrier and adjustable in their actual and relative positions thereon. Slitters of this character and possessing these features are well known, and it is not thought necessary in the drawings to show details of the slitter in these particulars. Any slitter of any particular character or construction, adapted to the ends to be described, will serve.

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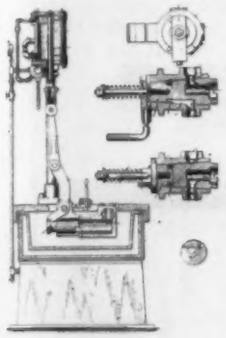
1,292,484. January 28, 1919. **Casting Apparatus.** John Kralund, of New York, N. Y., and Marcus Stern, of Toledo, Ohio, assignors to Doehler Die-Casting Company, of Brooklyn, New York.

This invention relates to casting apparatus and more particularly to a type as shown in cut, in which molten metal is forced from a cylinder into a metal die in making pressure die castings.



An apparatus made in accordance with the invention is specially adapted for making castings of the lower fusion white metal alloys, and is automatic to the extent that the rate of flow of the metal into the die, the force or pressure exerted upon the metal during the casting operation and the return of the plunger to normal to recharge the pressure cylinder, with the incidental agitation of the molten mass in the melting pot, is mechanically controlled. This permits the production of a large number of castings under identical pressure conditions; avoids those variations in castings resulting from the impossibility of a man always applying the same force to the plunger or operating it at the same rate of speed and gives greater capacity to the machine as compared with hand operated machines.

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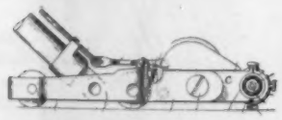
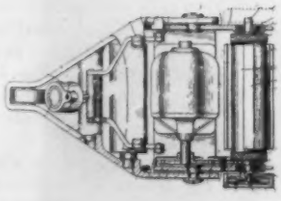
1,294,430. February 18, 1919. **Polishing-Machine.** Wm. Eichberger and Edward Watson, of Woodhaven, N. Y.

This invention relates to polishing machines, and particularly to machines of this class designed primarily for use in polishing floors; and the object of the invention is to provide an improved machine of the class specified which is comparatively simple in construction,, efficient in operation, and which may be easily and conveniently manipulated by hand, and by a single operator; a further object being to provide a machine of the class specified which, in addition, to serving as a floor polishing machine may also be used for other purposes as will hereinafter appear; and with these and other objects in view the invention consists in a machine of the class specified, constructed and operated as shown in the cut.





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1,293,426. February 4, 1919. **Alloy.** D. J. Hauss, Aurora, Ind. Barbara Hauss, administratrix of said David J. Hauss, deceased, assignor to F. W. Galbraith.

The new alloy possesses the following characteristics. The metals are present in substantially the following proportions:

72 parts aluminum,
24 to 25 parts zinc,
3 parts copper.

It melts at approximately 1000° F., and is very fluid, as distinguished from "pasty" so as to adapt it to the formation of thin, sharp and strong castings. Its tensile strength is in excess of 40,000 pounds per square inch. Its specific gravity is not materially greater than that of metallic aluminum.

The proportion of copper may be varied slightly; an increase in the amount of copper increases the tensile strength, but also raises the melting point, while a decrease of the amount of copper decreases the strength, but does not correspondingly lower the melting point.

An increase in the proportion of zinc decreases the tensile strength and does not in other respects improve the qualities of the alloy. A decrease in the quantity of zinc does not improve the qualities of the alloy either by increasing the strength or reducing the melting point.

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1,293,823. February 11, 1919. **Soldering Flux.** Geo. P. Luckey, Wilkinsburg, Pa., assignor to Westinghouse Electric and Manufacturing Company, of the same place.

The patent covers:

1. A soldering flux comprising a mixture of substantially 65 per cent of zinc chlorid and 10 per cent ammonium chlorid with 25 per cent of a fused mixture of potassium chlorid and sodium chlorid.

2. A soldering flux comprising a mixture of substantially 65 per cent zinc chlorid and 10 per cent ammonium chlorid, with 25 per cent of a fused mixture of potassium chlorid and sodium chlorid in the proportion of 56 per cent potassium chlorid and 44 per cent sodium chlorid.

3. A soldering flux including a fused mixture of sodium and potassium chlorids and additional metallic chlorids.

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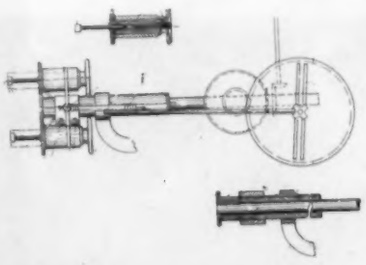
1,295,031. February 18, 1919. **Buffing Machine Attachment.** Maurice Horan, Waterbury, Conn., assignor to Waterbury Manufacturing Company of the same place.

This patent covers the following claim:

In a buffing machine, as shown in cut, the combination with the main buffing-spindle thereof, of a non-rotatable sleeve mounted for reciprocation thereon, a double one-piece chuck-carrier mounted upon the said sleeve and comprising a clamping-sleeve and two chuck-bearing sleeves which latter are arranged to permit the partial entrance of a buffing-wheel between them, chuck-spindles mounted in the said bearing-sleeves and each provided at its rear end with a gear wheel and at its forward end with a chuckspreader, a gear mounted upon the spindle and meshing into the said gears on the chuck-spindles for simultaneously rotating the same, and means connected with the double chuck-carrier for reciprocating the same simultaneously with the rotation of the chuck-spindles.



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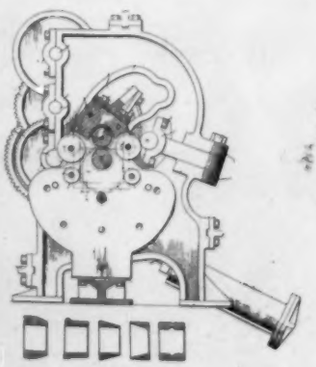
1,295,614. February 25, 1919. **Machine for Rolling Rings.** Wm. Scrimgeour, Washington, D. C., assignor to S. K. Manufacturing Company, Huntington, West Va.

This invention relates to apparatus for rolling rings, wheel-tires or other metal hoops, of the type wherein the work is operated upon between an inner and an outer roller.



It is the object of the invention to provide an apparatus, as shown in cut, of the character described that combines compactness, simplicity of structure and operation and great efficiency.

It is the particular object of the invention to provide such easy access to the rollers for the purpose of inserting the blank and removing the finished hoop that the machine and its rolling mechanism may be in continuous operation.

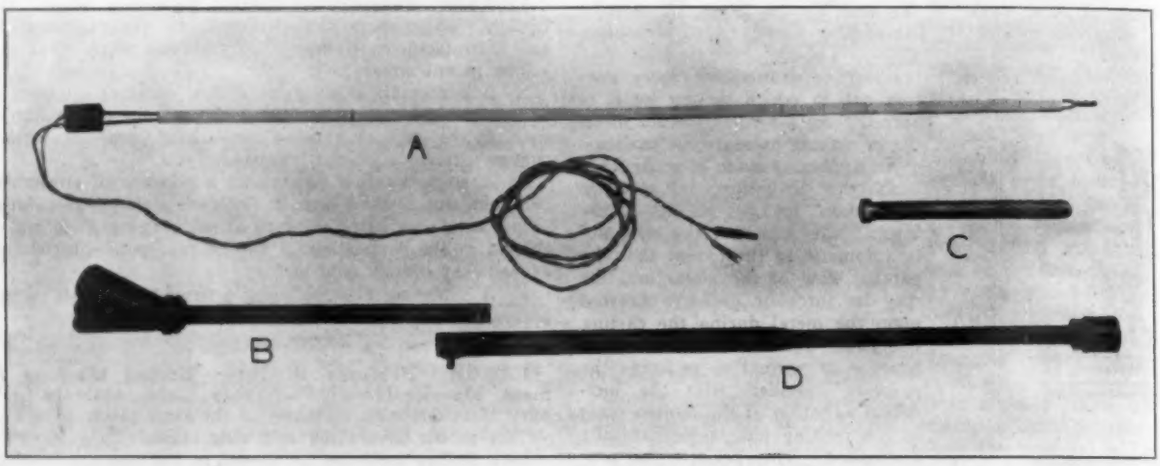
It is a further object of the invention to provide means for reducing the time for the rolling operation to a minimum.

# EQUIPMENT

## NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

### A PYROMETER FOR BRASS AND BRONZE

The importance of the pouring temperatures in the manufacture of brass and bronze castings is so well recognized, that comment on that fact is hardly necessary. Wrong temperatures are probably the chief cause of faulty castings. This factor enters not only into the production of the casting, itself, but the properties of the finished article are also affected.




VARIOUS PARTS OF THE PYROMETER FOR BRASS AND BRONZE.

USING THE PYROMETER.

The chief difficulty of measuring the temperature, by use of the ordinary thermo-electric pyrometer, has been due to the lack of a suitable protection tube for the thermo-couple. There is a limit to the thickness of the tube wall which is permissible, because of the necessity of a quick reading. The tube has to be of relatively thin walls, but at the same time it must successfully withstand the action of the molten material. Refractory tubes are not satisfactory because they are too fragile to stand ordinary foundry use, and are very apt to break under the sudden temperature changes encountered.

An alloy has been developed, however, by the Hoskins Manufacturing Company, Detroit, Mich., from which a satisfactory protection tube can be made which now allows the use of Hoskins Pyrometer in this very important field. Figure 1 illustrates how the equipment is used.

The tube consists of three parts, as shown in Figure 2. Section (B) telescopes into the upper end of the seamless steel tube (D), and the protection tube proper, marked (C), is held in the lower end. This tube is 10 in. long and is made of the new alloy CHROMON; it is that part of the entire tube which is inserted into the metal. The thermo-couple (A) is entirely encased in the tube and can be easily renewed.

The alloy tip and the thermocouple are the only parts which require renewal. When the molten metal ultimately destroys the alloy tube, it can readily be removed and a new one installed. A shoulder is cast on the upper end of the tip and this engages in the collar shown on the tube (D), being held in place by giving it a half-turn, and packing the connection with a special refractory cement.

If the tube is used to complete destruction or to a point where the molten metal can reach the thermocouple, of course the latter has to be repaired. This can be done by merely cutting off the damaged part, and then twist and re-weld the wires. This procedure can be repeated until the couple reaches a length of 3½ ft. when it must be renewed. In this connection, the couple can be changed "end for end;" that is, the unwelded end can be welded and used as the hot end.

It is not necessary to re-calibrate the couple after re-welding it. This is a very economical feature. Otherwise, unless facilities were available for calibrating, a complete new couple would have to be used whenever one burned off.

# ELECTRIC BAKING OF CORES, JAPANS AND ENAMELS

## Advantages of Using Electrically Heated Ovens in Foundries and Shops.

By A. M. Clark, Industrial Heating Department, General Electric Company.

Increased efficiency and maximum production are essential in every industrial plant today to keep down prices and successfully meet competition.

During the past two or three years a large number of industrial processes requiring heat have been greatly improved and simplified by the application of electrically generated heat, prominent among them being core baking. The advantages of electric heating, such as superior quality of finish, uniform product, practical elimination of rejects, increased production and greatly improved working conditions have made themselves felt and have been capitalized by automobile manufacturers and many other industries for baking japans, enamels, varnishes, insulation, etc.

### ELECTRIC OVENS FOR JAPANNING.

Fig. 1 shows an oven of the semi-continuous conveyor type, used for baking japan on electrical control apparatus, which illustrates the possibilities of distributing electric heaters in such a manner that all parts of the oven may be maintained at the same temperature. The heaters in this oven are mounted on the side walls and floor; the temperature being controlled by an automatic panel and a sensitive thermostat, by which the current is thrown on and off as the temperature in the oven varies any appreciable extent from a predetermined and set point.

FIG. 1—AN ELECTRICALLY HEATED OVEN OF THE SEMI-CONTINUOUS CONVEYOR TYPE USED FOR BAKING JAPANS.

### BAKING CORES BY ELECTRICITY.

Cores baked in ovens heated by electricity are invariably superior to those baked in fuel fired ovens and the advantages outlined above are equally adaptable to core baking. The absence of smoke in electrically heated ovens which is usually present in fuel fired furnaces, means clean cores and a cleaner foundry. The positive control permits holding the temperature of the oven safely below the burning point of the core compound and allows baking at the maximum rate without the danger of burning the cores. If a core is baked above a certain temperature the inner wall will be weakened with the result that the casting metal will wash away the core wall and the casting will have to be rejected. A further saving in core compound is realized due to the fact a core which is uniformly baked throughout does not require as much compound to hold the sand as does a core baked in a fuel fired oven.

The oven shown in Fig. 2 is a type of oven used for baking small cores. The cores are placed on the perforated drawers, each drawer being provided with an insulated back to prevent the escape and consequent loss of heat during reloading. In the foundry where this oven is used a marked saving in the cost of the cores has been effected. There is less breakage of cores during baking and a greatly reduced loss of the castings themselves, which cracked or imperfectly baked cores are often responsible for. This oven has a connected load of 24 kilowatts, and in production is baking 225 to 275 lbs. of cores per hour, depending upon their size and shape.

Generally speaking, cores are baked at from 350° to 500° F. for varying lengths of time from 20 minutes upward. Willys-Overland, Inc., at Toledo, Ohio, has two large continuous conveyor type core ovens heated by General Electric heating equipment; one of which is operated at 385° F., the time of bake depending upon the thickness of the cores.

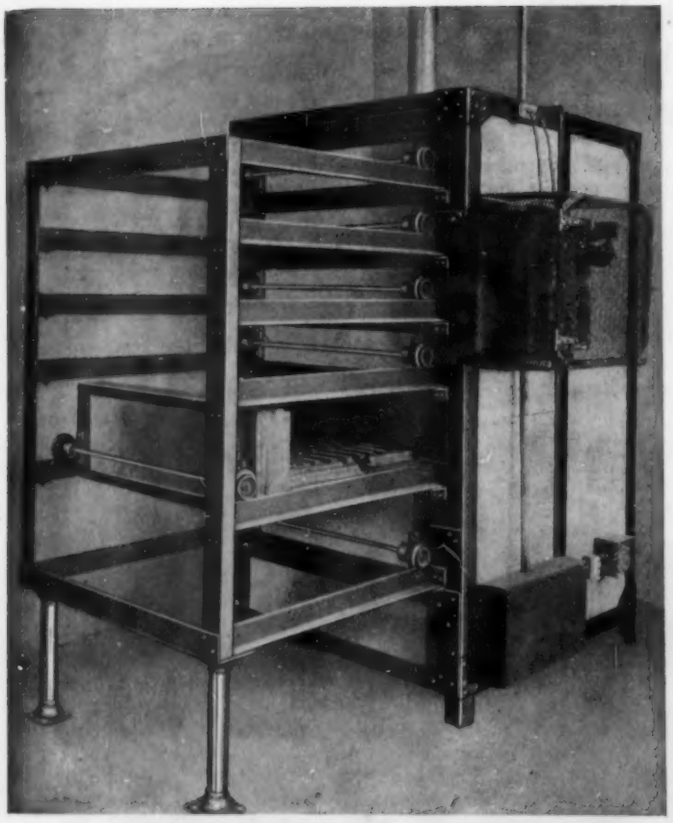


FIG. 2—ELECTRICALLY HEATED OVEN USED FOR BAKING CORES.

## A NEW CONVEYOR

To secure economical operation and greater efficiency in handling material, labor must be supplanted by machines and those selected which are best adapted for the particular work. Men with wheelbarrows are too costly to use in storing, moving or loading material, but, at the same time,

FIG. 1—A 19' 8" SCOOP CONVEYOR EQUIPPED WITH 16" WIDE BELT AND DRIVEN BY 2 H. P. ELECTRIC MOTOR.

the old style conveyors required a great deal of labor in shoveling the material up into the receiving hoppers.

A new type of portable conveyor, which cuts the labor of feeding one-half, is shown in the accompanying illustrations. The most distinctive feature of this machine, called the scoop conveyor, is the scoop on the feeding end, which can be pushed or completely buried into the mterial to be conveyed. This makes it possible to simply scrape the material onto the carrying belt, instead of lifting it up by shovelfuls into the feeding hoppers of ordinary conveyors.

Another exclusive feature of this machine is the construction of the sides or skirt plates as they are called. These form a trough which enables a 12 inch wide belt to equal in carrying capacity a 20-inch ordinary troughed belt. This is readily understood when one remembers that on a troughed belt, the material is carried in the center or trough, that on the sides falling into the trough or rolling back, whereas, the side plates on the scoop conveyor hold the material together, giving the whole width of the belt carrying effectiveness. It is due to the skirt plates, also, that a 24 ft. long scoop conveyor will convey material as high as a 30-ft. troughed belt. The resultant saving in belt expense is considerable, as two new 12 inch x 24 ft. scoop conveyor belts can be purchased for the price of one 20 inch x 30 ft. troughed conveyor belt.

While the scoop conveyor has been on the market only a short time, the manufacturers state that there are now over 1,000 in use and that they are receiving over 50 per cent repeat orders. This would seem to indicate that the machines are giving good satisfaction to their owners.

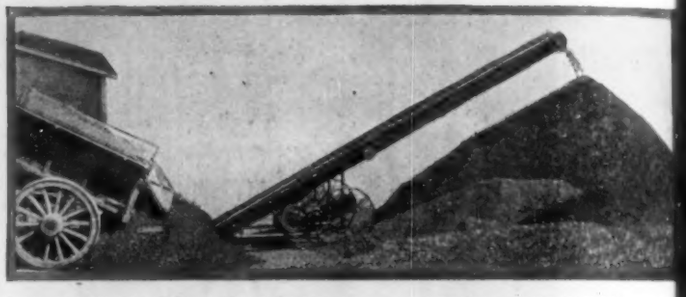


FIG. 2—UNLOADING FROM WAGON TO STORAGE PILE WITH A SCOOP CONVEYOR.

The scoop conveyor is made in three different sizes, 13 ft. 8 ins., 19 ft. 8 ins. and 24 ft. The width of the conveying belt on any of these sizes may be either 12 ins. or 16 ins. wide, as desired. Size 13 ft. 8 ins. elevates to a total height

FIG. 3—USING SCOOP CONVEYORS TO UNLOAD HOPPER BOTTOM CARS.

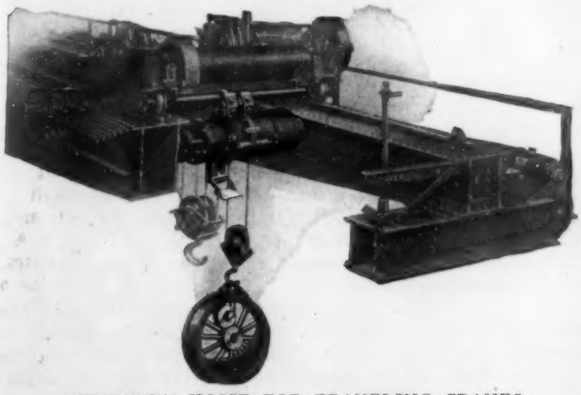
from the ground of 5 ft. 9 ins., the 19 ft. 8 ins. size may be adjusted for any height from 6 ft. to 9 ft., and the 24 ft. size may be adjusted for any height from 9 ft. to 12 ft. The machines are furnished with either electric motor or gasoline engine, or where customer prefers to furnish and install motor himself, motor support and drive from motor shaft are provided. For catalog and other information address the manufacturers, The Portable Machinery Company, Inc., Passaic, N. J.

## A PATENTED AUXILIARY HOIST FOR TRAVELING CRANES

A simple and practical auxiliary hoist for attaching to any standard overhead electric traveling crane, as shown by the illustration, has recently been developed by the N. B. Payne and Company, 25 Church street, New York City.

The crane lends itself to quick and easy attachment, as it is claimed by the makers that it can be attached "the day it arrives." The hoist does not take up any more room overhead, does not require an extra trolley, does not shorten the travel of the trolley on the bridge, nor does it interfere with the accessibility of the main hoist. It is plain that these advantages involve a considerable money saving.

It is pointed out by the manufacturers that the average traveling crane in a day's work usually handles a far greater number of light loads than heavy loads, and this is an im-



AUXILIARY HOIST FOR TRAVELING CRANES.

portant point worthy of investigation. Since cranes for lifting heavy loads are slow-moving, their use results in a serious loss of time if they also handle the light loads. Thus a 20-ton crane, direct-current, with a hoisting speed of 12 feet per minute per load will handle a three-ton load at but slightly greater speed. But with the auxiliary hoist a light load of, say, three tons may be handled at a very much higher speed—2 to 10 times as fast as the speed of the main crane.

Attachment of this auxiliary also effects an important power saving. Very often the hook and block of the main crane together weigh more than some loads frequently handled. The auxiliary hook and block being much lighter, it is evident that the power saving in a year's time becomes a worth-while item. The labor saving with the auxiliary hoist is another important item, especially when a gang of men must wait for a small piece being slowly moved by a large crane. This is a vexing circumstance with which many foremen are well familiar. The auxiliary eliminates this labor loss.

## HOW GERMANY LOST OUR BRONZE POWDER BUSINESS

A great deal of bronze powder is used in the United States. Up to August, 1914, little of it was produced in this country; our supplies came from Europe—principally Germany.

Bronze powder, used mainly by manufacturers of picture frames, furniture, bronzing solutions, wood and metal grills and by lithographers, is made in at least two hundred different shades and many degrees of fineness. The coarser the grade the lower the price.

Before the war, Germany had contracts at attractive profits with European concerns for most of their finer grades of powders. The coarser grades they could sell at almost any price offered and still make a profit because the coarser grades were a by-product.

Bronze powders are graded by screening. The finer grades pass through the meshes and are classed as high grade goods; the coarser grades do not pass through, are classed as a by-product and sold at a lower price, yet the coarser grades are suitable for many commercial purposes. The duty on bronze powder before the war was low and need not be considered in fixing prices.

When the war stopped German competition, American manufacturers showed their ability to produce bronze powder in shades and grades equal to anything foreign makers had in the past shipped to this country. The larger volume of business they enjoyed enabled them to reduce selling prices materially.

After about four years of trading with American manufacturers, consumers are today willing to admit that the domestic powders are satisfactory in respect to price and adaptability to specific purposes.

In view of their increased trade, American makers of bronze powder are not now compelled to use exclusively scrap material in their manufacturing processes; they can now grind pieces of pure bronze, thus turning out a better finished product and at the same time, increasing production.

It is very unlikely that Germany will regain the American market for bronze powder. Only a lower price will make that possible. If necessary (as does not now seem probable), Congress will prevent the ruination of the American industry by a reasonable protective tariff.

## DIE STOCK AND PIPE CUTTER

The Borden Company, Warren, Ohio, manufacturers of the well known Beaver Easy Working Die Stocks and Square-End Pipe Cutters, has just brought out a new pipe threading device known as the No. 3 Beaver Junior.

This little tool is built on the "unit" plan to thread ⅛-in., ¼-in., ⅜-in., ½-in., ¾-in. and 1-in. pipe. It can be purchased complete or the units can be bought separately.

The No. 3 Beaver, Jr., consists of a ratchet handle and separate die heads to thread each size of pipe. The whole outfit is attractively finished and packed in a convenient wooden case. It makes an ideal tool for the home as well as a very practical tool for the workshop.

In keeping with the high quality of other Beaver tools, the No. 3 Beaver, Jr., possesses certain unique and valuable me-

NO. 2—BEAVER, JR., DIE STOCK.

chanical advantages. For instance, the ratchet mechanism is entirely encased so that it is impossible for dirt or grease to accumulate and retard the action of the tool, this is an important advantage. The introduction of 1-in. size to the range is another advantage which will be greatly appreciated by the trade.

Advertising literature describing the No. 3 Beaver, Jr., may be had by writing to the Borden Company, Warren, Ohio.

## DUSTITE RESPIRATOR

Some very significant data for the metal worker is given in a recent folder issued by Walter Soderling, Inc., manufacturer of the Dustite Respirator. This data is as follows:

THE TERRIBLE TOLL OF DEATH IN THE DUSTY TRADES,
Between the Ages of 25 and 44, From Tuberculosis of Lungs and Respiratory Diseases Caused or Aggravated by Dust.

| | |
|---|---|
| In occupations exposed to Mineral Dust.....52.6% | Potters, Tile Makers, Glass Blowers and Cutters, Marble and Stone Cleaners, Cutters and Polishers, Core Makers, Molders, Lapidaries, Lithographers, Paper Hangers and Plasterers. |
| In occupations exposed to Metallic Dust.....58.6% | Grinders, Polishers, Cutlery, File and Tool Makers, Brass Molders and Finishers, Gold Beaters, Jewelers, Gold and Silver Polishers, Type Founders, Engravers, Printers and Pressmen. |

(The above figures taken from the Statistician's Table of The Prudential Insurance Company of America.)

In connection with the above, the manufacturer states that the Dustite Respirator is the only one that has passed the test and secured the approval of the Underwriter's Laboratories for the protection of workers in all dusty conditions. Full information and prices may be had upon request from Walter Soderling, Inc., 347 West Broadway, New York.

# ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

## AMERICAN FOUNDRYMEN'S ASSOCIATION

C. E. Hoyt, secretary-treasurer of the American Foundrymen's Association, has sent out the following bulletin:

Philadelphia, Pa., the birth place of the American Foundrymen's Association, has been selected as the place of the 1919 convention and exhibit, and the time, the week of September 29. This announcement, we are sure, will be gratifying to members and especially to those who attended the first meeting in Philadelphia, June, 1896, when the association was organized, and also to those who attended the second meeting in 1907 and recall the generous hospitality of the Philadelphia foundrymen at that time.

Many things of interest to foundrymen have been constructed and developed in the Philadelphia district since the last meeting in that city, including the great plant at Hog Island, the new foundries at the League Island Navy Yard and the great foundries of the Westinghouse Company at Essington. Details of the program, hotel headquarters, and arrangements will be announced in later bulletins.

With the selection of an eastern city it is the plan of the officers to make this occasion an international affair. Invitations will be extended to foundrymen and industrial engineers generally in England, France, Belgium, Italy and other European countries, South American countries and Australia, to attend this convention, since the time seems unusually opportune for holding a meeting of international scope.

It is none too early to make arrangements now for attending what will be, without doubt, the greatest Foundrymen's Convention of all times. Mark the dates, September 29 to October 4, on your calendar. A list of hotels and rates will be furnished soon and a committee of local foundrymen is already being organized whose function it will be to see that you are comfortably taken care of.

We want every member to consider himself personally appointed an unofficial member of the Papers Committee and to assist in securing good material for the technical program. There are subjects which you can discuss and prepare papers on. Subjects which you want to hear discussed. The Papers Committee want this information from you. A blank for this purpose is enclosed with an addressed return envelope. Note the date printed thereon "Not later than April 15, 1919." The committee will especially appreciate it if you will furnish them with the names of persons qualified to write on any particular subject. Do it now.

The exhibits will be located in one of the buildings of the Commercial Museum where larger and more satisfactory accommodations will be provided than we have ever had. The fact that we are no longer subject to war conditions which have handicapped the Department of Exhibits for the past three years and with a building at our disposal that excels any previously used, the greatest of all exhibits can be looked for.

We call your attention to the fact that the executive offices of the American Foundrymen's Association are now located at 1401 Harris Trust Bldg., 111 West Monroe street, Chicago. All communications for the Secretary-Treasurer should be addressed there, and a cordial invitation is extended to you to visit our offices whenever we can be of service to you.

## AMERICAN ELECTROCHEMICAL SOCIETY

The American Electrochemical Society held its thirty-fifth general meeting at the Chemists' Club, 52 East 41st street, New York, April 2, 3 and 4. Among the papers that were presented at this meeting were "Electroplating on Iron from Copper Sulphate Solution," and "Remarkable Pitting of Electroplating," by O. P. Watts. These papers are published in this issue of THE METAL INDUSTRY. One of the features of the meeting was a symposium on Released Information in which the following took part:

A. B. Lamb: Portable Electric Filter for Smoke and Bacteria.
E. Gudeman: Chemical War Secrets and Releasing Manufactures' Reports.
W. H. Walker: The Edgewood Arsenal.
O. Hutchins: Silicon Tetrachloride.
G. A. Richter: The Role Played by Silicon and Titanium Tetrachlorides During the Past War.

An all day excursion was enjoyed on Saturday, April 5, to Perth Amboy, N. J., and vicinity where the following plants were inspected: American Smelting and Refining Company, United Lead Company, Raritan Copper Works, Roessler and Hasslacher Chemical Company.

## AMERICAN ELECTROPLATERS' SOCIETY

ROCHESTER BRANCH HOLDS SIXTH ANNUAL BANQUET

That now is the time to regulate abuses of this country by the foreign element was urged by Alfred A. Ruttan, manager of the Premo division of the Eastman Kodak Company, principal speaker at the sixth annual banquet of the Rochester branch of the American Electro Platers' Society, held on Saturday night at the Osburn House. Charles V. Haring was toastmaster.

Covers were laid for more than fifty members and guests and an excellent menu was served. Instrumental and vocal music was furnished by Arthur Charity, leader; William Barry, Frank A. Emma, and William F. Johnson, employment manager for the Taylor Instrument Company.

Mr. Ruttan discussed the relations of humanity toward one another from his own viewpoint. At the outset Mr. Ruttan declared himself to be a staunch supporter of the republic and the constitution, and that he insisted upon a true spirit of Americanism at all times. He was opposed to all sorts of propaganda that tended to interfere with the smooth workings or the progress of American ideals and ambitions, and declared that by being loyal to ourselves and to our country happiness and prosperity was found to be our lot.

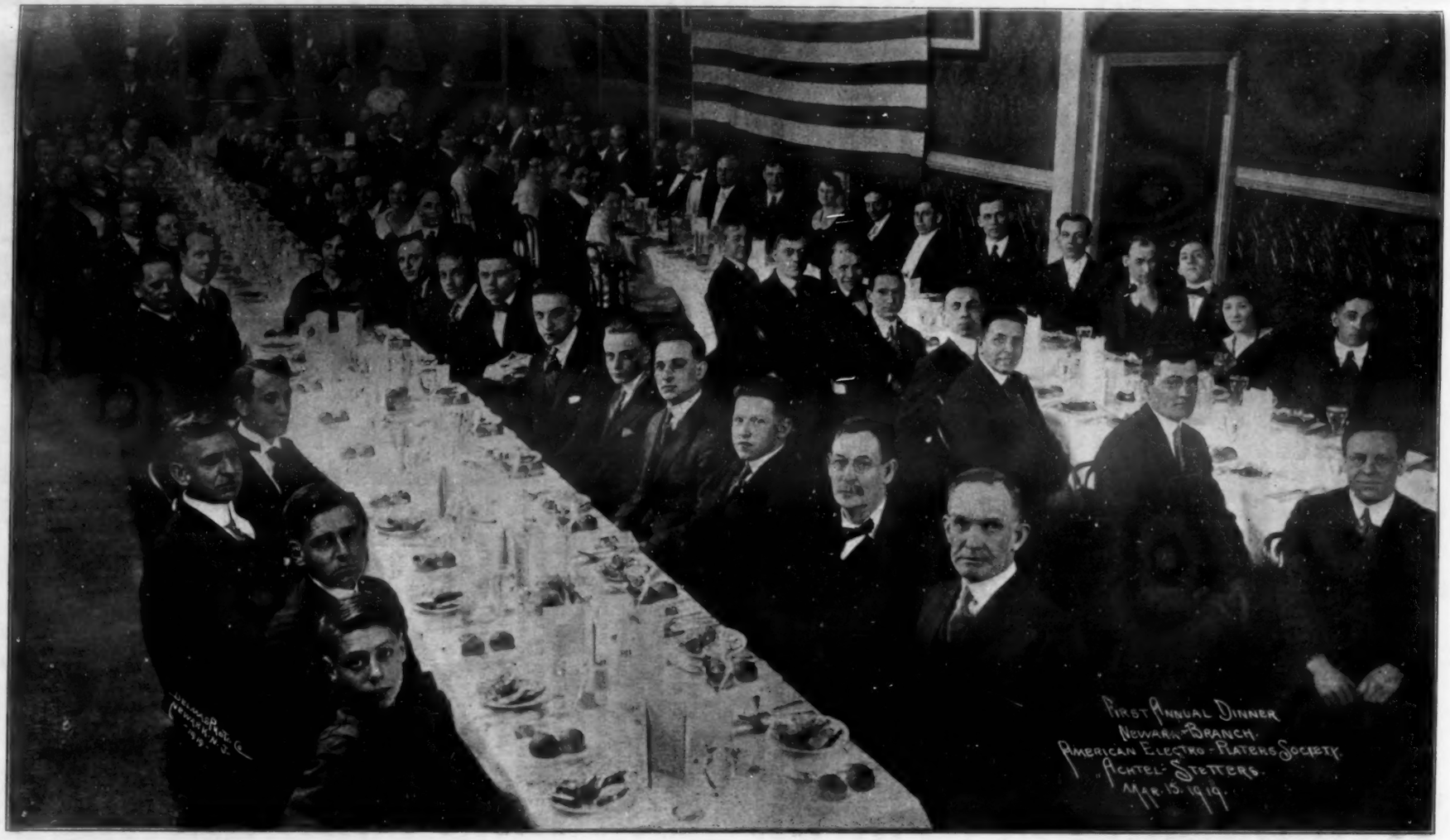
"America, heretofore," he said, "has been a haven for the oppressed. It has been so regarded all over the world; everybody and anybody were allowed to come into this country as suited them. This country has gained, and we see it in our cartoons and elsewhere, the reputation of being the 'melting pot.' And we are. But I fear we have made one mistake. Any melting pot that is any good usually provides that the dross, and the element that cannot be amalgamated and cannot be woven into one good whole, should be skimmed off and thrown away. We have a lot of that element in this country; have some of it even born in this country.

"We have a certain number of people in this country of various nationalities who do not know the covenant of this country, do not know the spirit of this country, do not know what this country stands for, do not even speak our language, and cannot see except through colored spectacles or reading a paper of their own tongue. And I am advocating for our own peace of mind and our own liberty that it is high time that every red-blooded American begins to look to the abuse of this country by these people who come to it.

"Unless the immigrant coming to the United States is prepared to learn the language of the country, to come to sense its spirit, to understand the God of this nation, to understand the constitution of it, he has no business here and should be put out of here right away. I say this now because I am talking to Americans. It seems drastic, but we are coming to it."

The Rochester branch of the Electro-Platers' Society was organized six years ago with seven members. It had much opposition at first, but that condition has been gradually overcome until now every big manufacturing plant in Rochester is interested in its material progress and prosperity. The officers of the society are George H. Hesselink, president; Thomas Harper, vice-president; Sylvester Gartland, secretary; and Adolph Wahl, treasurer.

Among the firms having exhibits at the meeting were the Taylor Instrument Company, the Hickox Manufacturing Company, Todd Protectograph Company, Metal-Arts, and the J. B. Ford Company, Wyandotte, Mich.




FIRST ANNUAL BANQUET OF NEWARK BRANCH OF THE AMERICAN ELECTRO-PLATERS' SOCIETY, HELD IN NEWARK, N. J., MARCH 15, 1919.

The first annual banquet of the Newark Branch of the American Electro-Platers' Society took place at Achtel-Stetters, Newark, N. J., on Saturday evening, March 15. For a first attempt at holding a banquet, the Banquet Committee, consisting of Horace H. Smith, O. F. Carlson, John L. Merigold, and Edward W. T. Faint, certainly deserve a great deal of credit for its untiring efforts. There were one hundred and four present, including thirty ladies, who were quite in evidence, as is shown by our photograph. Walter L. Mitchell, superintendent of Tiffany and Company, Forest Hill, N. J., was toastmaster and he introduced the speakers, the Rev. John H. Clifford, who spoke on "Echoes from 'Over there,'" and the Rev. A. W. H. Thompson. During the evening A. M. Ramsdell, of Bayonne, N. J., entertained the diners with solos.

At the conclusion of the banquet and speeches, members and guests spent the rest of the evening in dancing. The officers of the Newark Branch are: F. W. Matts, Jr., president; George Reuter, Jr., vice-president; O. F. Carlson, secretary; William Meyers, treasurer; Oliver Sizelove, chief chemist; Edward W. T. Faint, librarian, and Theodore Kreuder, sergeant-at-arms, and Henry Bergfels, Philip Sievering and John L. Merigold, trustees.

## WORK OF THE BUREAU OF STANDARDS ON ELECTROPLATING

The following announcement has been sent out by S. W. Stratton, director of the Bureau of Standards, Washington, D. C.:

As was stated in January in the Monthly Review of the American Electroplaters' Society, efforts were made to secure from Congress a small special fund for work in this field. Owing to the many demands upon Congress at that time, it was not possible to secure this or numerous other special funds requested by the Bureau. However, in view of the importance of electroplating to many industries, and of the advantage of continuing the investigations now in progress, it has been decided to make an allotment of $10,000 for this work from the Industrial Research Fund recently appropriated to the Bureau for the year beginning July 1, 1919. Reports upon the progress and results of this work will be published from time to time in this and other technical journals, and in the Bureau publications.

Even with the annual expenditure of the above sum, it will require a considerable period to study the many kinds and problems of electroplating. More rapid progress could no doubt be made if additional funds were available. If, therefore, the platers or manufacturers interested in electroplating desire to contribute to the support of this work, preferably through the American Electroplaters' Society, satisfactory arrangements can no doubt be made. Such support might either take the form of annual subscriptions from firms, or of the employment by firms themselves of persons to work at and under the direction of the Bureau of Standards upon some problem of general interest. In the latter case the facilities of the Bureau could be employed with the understanding that all the results of such work would be made available to the public.

In order to make this work of value to the industry, it is important that in the future as in the past, we should receive the active support and assistance of the electroplaters, who are therefore encouraged to send to the Bureau information possessed by them, and requests for information desired by them.

# PERSONALS

### ITEMS OF INDIVIDUAL INTEREST

**N. E. Dabolt,** formerly New England sales manager of the Celluloid Zapon Company, has been transferred to the main office at 200 Fifth avenue, New York.

**E. W. Snyder,** for many years with J. B. Sipe & Company, is now with the Hilo Varnish Corporation, Brooklyn, N. Y. He will make his headquarters in Pittsburgh, and serve the trade in western Pennsylvania, eastern Ohio and northern West Virginia.

**Robert J. Martin** has given up his position as foreman of the rod mill of the Coe Brass Branch of the American Brass Company, Torrington, Conn., and has gone to Buffalo, N. Y., to become assistant superintendent and mill manager of the Buffalo Branch of the American Brass Company. **Arthur Brimble** has succeeded Mr. Martin as foreman of the rod mill.

**J. Fred Smith,** 164 Ashland avenue, Bloomfield, N. J., formerly electrical engineer with the Air Nitrates Corporation, New York, who were direct agents of the Ordnance Department, U. S. A., for the design, construction and operation of ammonium nitrate plants, has been engaged as electrical engineer and field representative of the American Boron Products Company, Reading, Pa. Mr. Smith may be consulted without charge in any matter where Boronic products may serve to help the metal manufacturers.

**Thomas W. Pangborn,** president and treasurer Pangborn Corporation, Hagerstown, Md., has been appointed a member of the Maryland Readjustment Committee, which will give aid and counsel in matters applying to manufacturing, finance and transportation. Mr. Pangborn will represent the western part of the State, serving with the following: Governor Emerson C. Harrington; William Ingle, president Baltimore Trust Company; Holden A. Evans, president Baltimore Dry Dock & Shipbuilding Company; A. W. Thompson, vice-president B. & O. R. R.; A. C. Bruce, president Bartlett-Hayward Company, and others, totaling 15.

**Frederick F. Fuessenich** on March 29 tendered his resignation as president and treasurer of the Hendey Machine Company, Torrington, Conn., to take effect on April 1. He has been with the company as stockholder and director ever since its organization nearly 45 years ago. His retirement at this time is because of failing eyesight. The resignation was accepted with deep regret by the directors. Mr. Fuessenich will serve as chairman of the board of directors for the ensuing year. To fill the vacancy caused by Mr. Fuessenich's resignation, Charles H. Alvord, who has been vice president and general manager since 1906, was elected president and treasurer, and Robert C. Swayze, vice president. The other officers are: Secretary, F. N. McKenzie; assistant treasurer, Frederick W. Fuessenich, son of F. F. Fuessenich, and assistant secretary, John Jack.

## ALBERT LEIMER

Albert Leimer, employed by the Motor Products Corporation, Detroit, Mich., as foreman of the plating department, enlisted December 7, 1917, in the Ordnance Corps. From Detroit he was sent to Columbus Barracks, Ohio, and stayed there two weeks, then went to Camp Grant, Ill., with the expectation of going overseas with an ordnance detachment.

While in Camp Grant he was taken sick and spent about six weeks in the hospital. Shortly after being released from the hospital he was sent to Camp Sheridan, Alabama, for six weeks.

ALBERT LEIMER.

Orders came to go to Camp Hancock, Georgia, which at that time the government contemplated making a permanent ordnance training camp. Another order came later to the effect that the Aberdeen Proving Grounds, Aberdeen, Md., needed men, as the work there was planned on a tremendous scale. Shortly after arriving at the proving grounds he was given the rank of corporal.

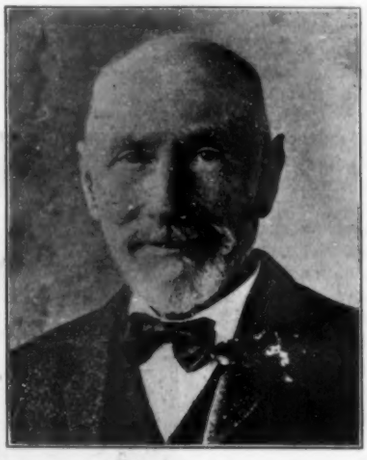
Corporal Leimer wishes to state that the work was very interesting, especially such work as testing powder, shells, shrapnel and guns on acceptance work which was to be used on the front lines in France. Corporal Leimer was released from the service March 6, 1919, and is back again in Detroit with the Motor Products Corporation.

# A CONNECTICUT NONOGENARIAN

T. H. Baird, After Eighty Years as Inventor and Builder Still Tends to Business.

Oakville, Connecticut, is a small town of scattered houses lying along either side of a main road running out of the prosperous city of Waterbury. The population to-day is nine hundred inhabitants and the population one hundred years from to-day likely to be around the same fixed number.

Oakville is not a growing kind of a town, it is settled, sedate, prim, a back eddy of civilization that breeds mechanical ingenuity in the same manner that some places breed politics. It has always had that mechanical atmosphere. On all sides and within a few miles of the town, are established, shops, mills and factories that represent some of the oldest established businesses in the country. Oakville itself possesses a factory that has been running continuously since way back when factories first originated on this side of the water. All through this district of New England, machinery, inventions and new products becomes a birthright of every native son, it is born in the flesh, bred in the bone, breathed in with the air and taught by every power of environment, school, play and social and business usage. Within a circle of one hundred miles of Oakville was originated most of the modern shop tools as we know them, highly developed lathes, planers, millers, drills and all the various metal and wood working machines that have become so necessary to present day manufacturing. The idea of standardized machinery was worked out within this circle, the first automatic machines were built here, and about seventy per cent of the common ordinary products as pins, needles, buckles, fasteners, hairpins and such odds and ends were developed to a quantity production by the machinery of this little district. To understand a man, first become acquainted with his environment.



J. H. BAIRD.

Mr. J. H. Baird was born in Oakville in 1827. He received the customary education of the period, a groundwork of reading, writing and arithmetic. At the age of ten he was working in the shop of Scovill & Buckingham Company of Oakville (now the Scovill Manufacturing Company of Waterbury), who were making butt hinges and other articles of house and general hardware. He was with this firm for nine years or from 1837 to 1846. Being then nineteen years of age and having a small sum of money he went to Huntington, Connecticut, and opened a shop for the manufacture of tools, presses and special machinery.

The one great characteristic of Mr. Baird's make-up is, that he is "an inventor first and a business man afterward." Friends will remember an often repeated remark of his, "Well, I don't care if I did lose money I made the dern thing work." This idea of "making a thing work" seems to have been one of his earliest business impressions and it has consistently followed him throughout his long and busy life. Money or profit was of a secondary consideration and only necessary as an aid to "making the dern thing work." With these ideas it can be readily understood that his Huntington venture was not profitable. He did not fail and he had no difficulty in getting business, but every machine that he turned out was invented, improved, manicured, marcelled and generally treated with the same loving care that a mother devotes to her first born. Under these circumstances the price received was very often much less than the actual cost of manufacture and the enterprise was successful only in establishing the fact that "young Baird could do things in the machine line."

After four years of this reputation building and financial loss he shut up shop and returned to Oakville. The Scovill and Buckingham Company bid for his services and he again entered their employ in January, 1851, moved with the company to Waterbury and stayed with them until 1854. Feeling the urge for greater things and having got together another sum of money he returned to Oakville and built what is now known as Slades Mill. Mr. J. C. Welton was at that time very active in the management of the Oakville Company, a firm that manufactured pins and many small articles in the notions line. He had become familiar with the work of young Baird and recognizing his natural inventive ability made him such flattering offers of financial return that Mr. Baird disposed of his mill and entered employ of the Oakville Company. His job was to design tools and machines and he did this so successfully that the Oakville Company not only became the quantity output leaders in their line, but the trade today, all over the world, is using machinery that aside from a few attachments is basically the same that Mr. Baird built at that time. Mr. Baird remained with this company for seven years, he married during this period and built the house that is still standing on Falls avenue.

About 1861 he joined forces with the Benedict and Burnham Manufacturing Company of Waterbury, now part of the American Brass Company, and soon afterward became interested in the Naugatuck Machine Company of Union City. The shops of this latter concern were burned down in 1878, the loss was total and the company never resumed business. Mr. Baird then formed the Baird Pin Company and occupied a part of the building now known as the Oakville Lower Pin Shop. While retaining his interest in the pin company he was again employed by Benedict & Burnham Manufacturing Company to improve their machinery. He now successively became interested in the Waterbury Machine Company, Baird Pattern Shop and Henderson Brothers of Waterbury.

Eventually Mr. Baird disposed of his interest in Henderson Brothers, brought his other interests under one head and organized the Baird & Warner Company, which shortly changed its name to the Baird Machine Company. Mr. Baird has the natural gift of inventive imagination. If given an article to make he is able to vividly picture the various operations in his mind, and he can see the mechanical movements of a machine necessary to perform these operations. If left to his own devices he can without drawings or figures, make his own pattern and while waiting for the castings he will make such steel parts and tools as are required. Later he will combine the castings and steel parts so as to form a successfully working machine. His proposition has always been that a "machine can be made to do anything that the fingers can do if it is not required to think."

In his lifetime Mr. Baird has invented some very wonderful machines, machines that take the raw material and automatically turn out finished products at the rate of several hundred a minute, machines that count, number, discard imperfect goods and do things that verge closely on the human power to think. Of the thousands of little things that have become a part of our daily existence fully ninety per cent of them are made on Baird machinery. It would be impossible to stop any person on the street, either man, woman or child and not find them wearing some pin, clasp, button, fastener or something originating on Baird machinery. The same thing holds good in the trades, typewriters, clocks, eyeglasses, parts that go on locomotives, electrical equipment, every industry that requires parts to be made in large quantity is more than likely employing some form of a Baird machine. Being a producer of small articles, Mr. Baird very naturally became interested in the problem of finish, as also, the best and cheapest method of obtaining such finish. As a consequence the process of tumbling very early attracted his attention. He was one of the first to see the many hours of time that could be saved, the superior finish that could be obtained and the immense amount of labor and worry that could be eliminated by a process, that would combine a correct adjustment of work and materials in the tumbler, with a properly designed barrel and machine for operation. From his early ideas has grown up a business that keeps regularly in stock one hundred and six combinations of tumbling outfits and these machines are shipped

to all parts of the world. The regular, automatic and special machines bearing the Baird name can be found in every country that does a manufacturing business.

Mr. Baird is now 92 years old, active, hale and hearty. Since 1901 the management of the Baird Machine Company has been in the hands of Mr. C. L. Warner and Mr. Baird has been active only in consultation over mechanical problems. In the course of years Mr. Baird has drawn around him a distinctive body of natural yankee inventors, mechanics and engineers. His greatest pride to-day is not in the size of the Baird Company business, but in the knowledge that the "organization can create a machine and make the dern thing work."

## DEATHS

### CEPHAS B. ROGERS

**Cephas B. Rogers,** one of the founders of the famous Roger Brothers Silver Company, died at his home in Meriden on March 15 at the age of 82 years.

Although advanced in years, Mr. Rogers was in the best of health until about a week before he died, when he was taken with a severe chill which developed into pneumonia which caused his death.

Mr. Rogers was born in Saybrook, December 30, 1836, to Hervey Rogers and Elizabeth Byron Rogers. The family moved to Meriden in 1849 where the father became manager of the Rogers hotel.

Cephas Rogers was educated in the public schools of his city, completing his schooling in the Meriden academy. He worked at times in a factory where tinware and japanned goods were made. Later he took advantage of a better opening as clerk in the office of a lumber and coal company.

CEPHAS B. ROGERS.

It was in the stirring times of 1863, that he was clerk in the New Haven House. While in this position he was given the privilege of accompanying Abraham Lincoln when he made addresses through the state introducing representative citizens tohim.

It was during a period of rest, enforced by poor health, in Meriden that the partnership of C. Rogers and Brothers was planned and completed in February, 1866. Mr. Rogers' two brothers, Gilbert and Wilbur F., were skilled manufacturers of silver-plated wear and there appeared to be room in the business world for a new company and a new factory in that line.

Beginning in a small way, the new firm advanced until it became one of the principal establishments in Meriden. The products were produced in three departments, silver plated spoons, forks, knives and table ware; casket trimmings and undertakers' supplies; and furniture hardware.

When the International Silver Company was formed, the C. Rogers & Brothers Company was the last of the Meridan factories to enter. It was bought out by the trust January 1, 1903.

Mr. Rogers was prominent in the Methodist church. He was also one of the trustees of Weslyan University in Middletown. For six years he was a member of the city council.

Mr. Rogers was married in 1870 to Margaret, daughter of Dr. Peter F. and Anna M. Clark of New York City. Mrs. Rogers, two brothers, Wilbur F. and N. Burton, and one sister, Mrs. Isabella Young survive him.

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**Samuel B. Dusenberre,** western sales manager, New Departure Mfg. Company, died at his home in Detroit, March 26, of pneumonia. For the last eight years Mr. Dusenberre had been in charge of the western territory of the company and was formerly general manager of the Westinghouse Storage Battery Company, and purchasing agent of the Westinghouse Machine Company, Pittsburgh. He was a member of the Society of Automotive Engineers.

### CHARLES R. WISE

**Charles Ralph Wise,** president of J. B. Wise, Inc., Watertown, N. Y., died at his home in that city, February 26, after an illness of fifteen days

CHARLES R. WISE.

Mr. Wise was born in Watertown, August 29, 1882, the son of Mrs. Harriet Willard and the late James B. Wise. He was educated in the local schools and later took a course in the Albany Business College. He returned to enter business with his father in the plumbing supplies factory in Mill street. Later he was sent to Dolgeville, this state, to take charge of a water system contract which his father prosecuted there. In 1907 he went to Boulder, Col., and for a time managed his father's gold mine there.

Upon his return from Colorado he again entered business in the factory, acting as salesman for a time and also occupying the position of general superintendent. He was made a member of the firm and elected to the office of vice-president of the company known then as J. B. Wise, which was organized in 1872. In 1912 the concern was incorporated under the name of J. B. Wise, Inc.

Upon the death of his father, ex-Mayor J. B. Wise, on June 7, 1916, C. Ralph Wise was elected president of the company and held that office to his death.

There survives besides the widow, his mother, Mrs. Harriet Willard Wise and one brother, Earl W. Wise.

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**F. A. W. Kieckhefer,** president of the National Enameling and Stamping Company, died March 26 at his home, the Strathmore, Riverside Drive and 113th street, New York City, as the result of a stroke of apoplexy. Born in Milwaukee, Wis., in 1852, Mr. Kieckhefer went to New York about ten years ago. As a young man he engaged in the retail hardware business, and later became a manufacturer of sheet metal goods.

In 1899 the National Enameling and Stamping Company was organized, and about ten years ago he became its president.

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**J. Bernard Borgeson,** aged 32, owner of the Borgeson Manufacturing Company at Torrington, Conn., died March 27 at his home in that place. Mr. Borgeson was born in Brooklyn, N. Y., but spent most of his life in Torrington. He established the Borgeson Company about four years ago and engaged in the manufacture of universal joints, machinery and tools, and the business was steadily expanding and its owner was looked upon as one of the rising young men of the community.

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**William Francis Hyatt,** associated with his father in the Brass Goods Manufacturing Company in Brooklyn, N. Y., died on March 24, at his home, 131 Buckingham Road, Flatbush, of pneumonia.

# TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

## WATERBURY, CONN.

APRIL 7, 1919.

Waterbury has started a "Build Now" campaign to relieve the unemployment situation here. The idea is to urge people or public corporations who have contemplated building to do it immediately so that employment can be obtained for the thousands of men discharged from the local munition factories.

The plan was started by the Rotary club who voted to appropriate $3,000 to advertising the reasons why people should build now. Aside from the motive of furnishing employment, other reasons have been advanced. The price of steel and copper has already dropped. Plumbing, most of which was held for government purposes during the war, has been reduced 25 per cent, owing to drop in the price of metals and in the diversion of labor back to the plumbing trade.

Considerable controversy has arisen as to the exact status of Waterbury's unemployment situation. The United States Employment Bureau officials have been claiming that the total of jobless men here has nearly doubled within the last month. Between 7,000 and 8,000 workers are without employment according to Ralph W. Budd, of the employment service.

It is estimated that about 3,300 of the unemployed are boys between 18 and 21 years of age and that about 2,000 are women workers. The large crowds attending the afternoon shows at the theaters indicates that the condition of a large part of the unemployed is not yet desperate, but an increasing number of cases of real suffering are being reported at the Associated Charities, and which require immediate attention.

RALPH E. DAY.

The unemployment problem already serious will be intensified by the expected release of 2,000 more workers from the factories during the next three or four weeks.

These are the statements issued from the employment office.

The Rotary Club Committee which was appointed to cooperate with the employment bureau, however, recently claimed that these figures were a gross exaggeration of the real situation. It was stated by the chairman of the committee that his committee had found 2,000 out of work. Many of these, he said, had been offered jobs, and had refused them.

A bureau for disabled soldiers has been opened here under the Home Service bureau of the Red Cross, to find either employment or special training for disabled soldiers unable to return to their old jobs in the brass factories.

Ralph E. Day has been appointed manager of the Waterbury Bross branch of the American Brass Company by the directors of the company. Mr. Day, who is also a member of the board of aldermen, and the board of safety, has been working in the interest of the American Brass Company for more than ten years. Starting as a clerk, his zealous work earned for him many promotions. A year ago, he became assistant superintendent of the Waterbury branch.

Under his direction, many time and labor saving devices were introduced which greatly benefited both the employes and the company.

H. W. Coe, superintendent of the Waterbury Brass Goods Corporation, will succeed Mr. Day as assistant superintendent of the Waterbury branch.

Payment of a 10 per cent bonus to the employes of the Scovill Manufacturing Company will be discontinued on April 3. This action was made necessary by poor business conditions, according to General Superintendent John H. Goss. The granting of bonuses was made possible largely through war work. All war work will be finished by April 1.

The Scovill company was one of the first in Waterbury to start the bonus plan. It began in the fall of 1915 with a bonus of 5 per cent of its net earnings paid in proportion to the wage. The next spring it was found possible to increase the bonus to 10 per cent and in August, 1917, a further increase was made to 15 per cent. Discontinuance of war orders made it necessary to cut to 10 per cent on February 1. It was stated that even without the bonus the wage scale at Scovill's was as high as at other manufacturing plants.

Waterbury manufacturers are rejoicing over the new freight schedule which has gone into effect. Shipments may now be made to all points in New England and in New York east of the Hudson river three days a week while previously only one or two days a week were allowed.

Notice was published in the factory of the Naugatuck Chemical Works that the plant will operate only five days a week until further notice. The plant will run 10 hours a day with Saturday a holiday.

## TORRINGTON, CONN.

APRIL, 7, 1919.

Three important factory construction contracts were awarded during the past month to the Torrington Building Company. One was for additions to the plant of the New Departure Company in Bristol, another for a branch factory building for Landers, Frary & Clark at Plainville; and the third for a factory for Peck, Stowe & Wilcox at Southington. The additions to the New Departure plant will consist of a building, 103 x 283 feet, to be used for the tempering shop, and a laboratory and office building, 30 x 103 feet. Both will be of brick construction with steel sash. There will also be two big concrete fuel oil tanks with a capacity of 250,000 gallons each. The addition for Landers, Frary & Clark will be four stories high, 162 x 60 feet, of brick and steel, and will be used for manufacturing celluloid products. There will also be a brick boiler house, 42 x 42 feet. The Southington factory will be six stories high of brick and steel, the main building being 112 x 55 feet with an el 22 x 43 feet. Construction work on all these buildings is already well under way, having been started immediately after the awarding of the contracts.

The approximate cost of the New Departure buildings will be $250,000, this being one of the biggest factory construction contracts awarded in this state since the signing of the armistice. The cost of the Plainville buildings was not made public.

The war chest board of trustees, of which F. L. Bramam, vice president of the American Brass Company, is chairman, has cancelled all pledges from March 1, the lessening of demands because of the cessation of hostilities having made further contributions unnecessary.

The plant of the Bantam Ball Bearing Company at Bantam, this county, closed down during the last two weeks of March while new furnaces were installed. The installation work as far as possible was done by the employes. There are about 100 men and women employed at this plant. It was announced recently that during the year 1918 these employes received above their wages, $18,000.

Henry G. Ellis, superintendent of the Torrington Manufacturing Company's plant, has been appointed chairman of the general committee to welcome returning service men. The committee is planning for a big parade and celebration on May 30 and 31.

Five of the 14 federal employment offices in Connecticut

closed on March 22, owing to the failure of Congress to appropriate funds to continue the work. The five offices were at Bristol, New Britain, Derby, Norwich and Middletown. The offices at Torrington, Hartford, Waterbury, Meriden, New London, New Haven, Willimantic, Stamford and Bridgeport are being continued temporarily by the state.

The employment situation in Torrington is on the whole fairly satisfactory. But few men are idle, although many are working on short time. The situation has been splendidly handled here.—J. H. T.

The housing situation has shown considerable improvement in Torrington during the past year. In this the town is more fortunate than many other Connecticut communities. In Bristol, for instance, the industrial situation is complicated by the fact that there are no houses or boarding places available for men imported into the city from other places. It is estimated that there are but little more than 2,700 houses in Bristol to take care of over 20,000 people. The demand for labor in Bristol is keen.

One especially notable thing in connection with the employment question is the fact that a majority of the manufacturers in taking on unskilled help specify that their new employees must be American citizens. Furthermore there has been a vigorous Americanization campaign in progress among those already employed. The effects of this campaign are noticeable in the night school, the enrollment in which has trebled and quadrupled within a few months.—J. H. T.

## BRIDGEPORT, CONN.

Returning soldiers are on every hand being supplied with jobs, many of them getting the jobs that they previously held. The Bullard Tool and Machine Company advertised in the local papers that every man in the service who had previously been in their employ could have his job any time he was ready to apply for it. It can be said that with scarcely any exceptions, all the factories of the city are following this plan and re-employing men who have left them for a longer or shorter period, to enter the service of the country.

The Minute Women of the city, working in conjunction with the U. S. Employment Bureau, the Manufacturers' Association, and the Charities Department, have been working for some weeks past to secure jobs for returned soldiers, sailors and war workers. The Minute Women have been especially successful in this endeavor and have secured part and whole time jobs for many men in places where previous efforts, made by others, met with failure.

About 400 returned service men have so far been supplied with positions, and it is estimated that about 300 more, at present in the city, are not working. In many of these cases, however, jobs are available for the men, but the opportunities are not seized by the men. It is estimated by those interested in this movement that all service men will be supplied with work inside of two weeks.

Women, who have been working in the various war munitions factories of the city, taking the places vacated by men going into the service, have in many cases given up their positions to returning soldiers, some relinquishing their jobs voluntarily, and others waiting until asked by Minute Women or others.

Many of the factories, when the women in their employ showed no signs of leaving of their own accord, discharged them and filled their places with returned soldiers and sailors. —L. M. P.

## NEW BRITAIN, CONN.

April 7, 1919.

Business conditions in New Britain are about the same as in other manufacturing centers. While there is no alarming lack of business, nevertheless, trade is not brisk and the heads of the various concerns are anxiously awaiting developments of the next few weeks. Previously it has been necessary in a majority of the factories to cut down on the working hours, owing to lack of business, but this far it has not been necessary to lay off any hands and the policy of the factories will be to provide as much work as possible for as many as possible.

The New Britain Machine Company, which for the past three or four years has been a hive of industrial activity, due to war orders from the American and Allied governments, has, during the past month, increased its working force to some extent in an attempt to rush through the last of a large order for machine gun tripods for the government. This work is now practically finished, but it is hoped that other work will be sufficiently plentiful to keep the working force busy. A new product reported at this concern is a new tractor which is said to be a nice piece of work. Landers, Frary & Clark, cutlery manufacturers, having practically finished most of the larger war orders for trench knives, mess kits and other army equipment, is now ready to proceed with renewed vigor on its domestic output. Inasmuch as domestic orders were sidetracked and pigeonholed during the war, in order to get a maximum output of government work, work on filling these will now begin and there is not expected to be any serious shortage of orders here.

The Stanley Works and its enormous facilities for the manufacture of bronze butts, etc., is working fairly steadily, and at the Russell & Erwin Manufacturing Company, the Corbin Screw Corporation, the Corbin Cabinet Lock division and other large concerns, work, while not rushing, is being stretched along as well as possible. Inasmuch as the peacetime output of all of the big local concerns consists principally of builders' hardware, it is evident that prosperity or business depression here will closely follow business conditions throughout this country and Europe. Should the building trades pick up during the next few months and there be a renewed activity in building, local concerns would immediately have to speed up production. On the other hand, if money is tight, building operations are few and far between and business conditions generally are stagnant, then it will probably follow that New Britain factories will also be dull. Therefore, the general prosperity of the country, and particularly the building conditions, are watched anxiously as the barometer of business conditions here.—H. R. J.

## PROVIDENCE, R. I.

April 7, 1919.

The continued easement in cost and supply of materials has offered opportunity for the metal industries to resume activities on a pre-war basis, but the all important requisite of orders checks any booming or rushing of business at this time. While the industry for nearly four years has been more or less (and generally more than less) harassed and handicapped through the shortage and high price of labor, it is now confronted with the opposite extreme of an overplus of available help which is daily growing in volume of numbers and demands.

The returning cohorts of young men who have been in the service of their country is furnishing a constantly increasing army of unemployed that is becoming a serious problem, and a threatening menace to any immediate industrial adjustment. It is estimated that in addition to other employes who are temporarily out of work in this city, there were on March 15, more than 3,000 returned soldiers and sailors seeking employment in Providence.

So serious is this situation becoming that the Providence Chamber of Commerce has adopted the slogan "Give the Fighting Man a Job," and is placing it conspicuously on all of its printed matter. One of the weekly luncheons given by the Chamber was devoted to a discussion of the matter of work for returning service men and Alfred M. Coats, chairman of the local board for the welfare of returning soldiers, addressed the more than 100 business men and manufacturers present for more than half an hour. He pointed out that Rhode Island, like all other States from which he had received official information, has so far been able to find employment for about one-third of the applicants for work. He urged the members to co-operate with his committee and to give preference to returning fighting men when filling positions, even though some sacrifice had to be made in so doing.

In addition to the other labor problems the 48-hour week movement is steadily gaining in strength and the new working schedule being adopted by the employers. And where this is not done it is being insisted upon by the employes. With the first of April practically all of the manufacturing jewelry concerns of Providence and the Attleboros, especially the larger ones, will have readjusted their business to the 48-hour scale, in many instances without reduction in wages from the 55 or

50 hour-week schedule. Generally speaking the manufacturing jewelry industry and its numerous allied branches show improving conditions and the outlook for this line appears to be for a steady business during the larger part of the year.

The Excell Manufacturing Company has been chartered under the laws of Rhode Island to manufacture jewelry and jewelers' findings at 45 Richmond street, with an authorized capital of $50,000. The officers are Wilhelm Kushner, president; Gottlob Armbrust, vice president and treasurer, and Charles Nass, secretary.—W. H. M.

## PHILADELPHIA, PA.

April, 7, 1919.

AMERICAN ELECTROPLATERS SOCIETY 1919 CONVENTION.

The 1919 National Convention will be held in Philadelphia, July 1, 2 and 3, the Hotel Bellevue-Stratford, Broad and Walnut streets, having been selected as Convention Headquarters.

At a well attended meeting held at the University of Pennsylvania Friday evening, April 4, the following committees were definitely announced by President Mott, of the Philadelphia Branch:

Finance, G. Gehling, chairman.
Hotel, J. L. Dinan, chairman.
Reception, E. T. Homan, chairman.
Badges and Printing, M. Smith, chairman.
Information, D. A. Metz, chairman.
Exhibits, W. P. Scott, chairman.
Educational, S. D. Benoliel, chairman.
Entertainment, W. J. Bell, chairman.
Program and Publicity, W. C. Gold, chairman.

President Mott is Convention Chairman and ex officio member of all the stated committees. The Convention Secretary is Philip Uhl, and the Convention Treasurer is Walter C. Gold.

Chairman Scott, of the Exhibits Committee, reported that the allotted space would permit of fifteen exhibits, and that they were already contracted for.

Chairman Smith, of the Badge Committee, showed numerous samples of Convention badges. The design of a local manufacturer was selected. This will consist of a wide red, white and blue ribbon with Independence Hall and a real facsimile Liberty Bell as pendants. Each delegate will be presented with one.

Chairman Gold, of the Program and Publicity Committee, reported fully in writing what he had done and exhibited "dummies" of the Souvenir Program, 6 in. by 9 in. This will be of 24 pages and cover. The front cover will be embossed with the monogram of the society and is printed in blue and gold, the city colors of Philadelphia. The program will contain a brief history of the society, portraits of the National Officers of the society and other interesting features. A copy of the Souvenir Program will be mailed early in June to each one of the 700 members of the society, together with a booklet, published by H. O. Wilbur & Sons, cocoa and chocolate manufacturers of Philadelphia, which will present 1,000 copies to the society. This work is entitled "Strangers' Directory of Philadelphia," and contains 24 pages of illustrations and descriptive matter covering places of interest in Philadelphia. It also contains maps of the cities of Philadelphia and Atlantic City, the latter being 60 miles directly east of Philadelphia.

Interesting letters were read from Royal F. Clark, secretary of the Bridgeport Branch, and from Sylvester Gartland, secretary of the Rochester Branch. They promised strong support of the convention and enclosed complete lists of their memberships. Letters commendatory were also read from "Father of the Society" Charles H. Proctor and National President Fraine.

Extra meetings will be held each month at Dooner's Hotel when convention work only will be discussed. The Philadelphia branch has been planning this convention for two months and are determined that this shall be "the Best Ever" Convention in the history of the society. That is the adopted slogan, and every member of the Philadelphia Branch is keenly interested in the matter. Further details will be published later.—W. C. G.

## ROCHESTER, N. Y.

April 7, 1919.

The month is closing very satisfactorily to Rochester manufacturing interests. In fact it is estimated that the net output of finished products in the metal trades line during this period has exceeded that of any previous year. The matter of readjustment to conditions that prevailed prior to the outbreak of the war in Europe is progressing slowly and effectively, and so far as Rochester is concerned it is anticipated that it will be one of the first cities in the United States to have recovered from the abnormal effects brought about by the titanic struggle across the Atlantic.

Despite the fact that the munition plants, the wonderful concerns established by the Symingtons of Baltimore, have practically ceased activities in this city, the great surplus of labor that the closing of the plants dumped upon the market is gradually being absorbed by other industries. While it is true that there are several thousand men and women out of employment in Rochester, a large percentage of this number were not actively engaged in wage-earning propositions prior to the adoption of the "work or fight" measure by the state authorities. This element of society, which will be found in every city, is using the "out of work" cry as an excuse for idleness in which they indulged prior to the advent of America in the struggle.

The Eastman Company is adding to its tremendous force of employes from week to week. The total is not large, but it is steady and permanent in character. All returning soldiers, who formerly were employed by the Eastman Company, are given places without further ceremony. If the job that the soldier formerly filled is not available, he is given one that is possible just as good and the salary is exactly what he received when he was called to the colors.

Employment managers in the larger plants are experiencing much difficulty in finding places for men and returning soldiers, owing to the reluctance of women and girls to vacate. In some cases female help has been dispensed with, men being assigned to their places. These incidents have provoked a good deal of criticism pro and con—the suffrage element asserting itself with a good deal of vindictiveness.

War-time wages is the one thing that stands out as a sort of sore spot in the complete reconstruction of industrial activity in Rochester. The feverish demand for materials and finished products during the war encouraged a demand for an increase in wages. The demand was also backed by the largely increased cost of living, plus the help required of labor in the floating of Liberty bond issues, the Red Cross contributions, and the War Chest demands. The union leaders insist that wages shall remain where they are and that no reduction in the slightest is possible. In this position they are standing very firm, and have the backing of almost a solidly organized city.

The railroad situation in Rochester is very satisfactory. In fact the shipping situation has been improving almost from the day the armistice was signed last fall. While conditions are not normal, they are not far from it. Shipments by freight or express out of that city are declared to be good. There have been some drawbacks in the way of incoming shipments. There is no difficulty whatever at this time in obtaining almost any required metal or by-product, and some of the larger manufacturing establishments are gradually replenishing their warehouses that were so depleted during the recent war. Of course these stocks will not be filled to completeness, inasmuch as the price-levels have not been reached as yet. But receipts of copper, brass and aluminum of late has been very large.

Rumors continue to prevail to the effect that the Ford interests are planning to locate a branch of the automobile industry in Rochester. It is said that from 100 to 200 acres on the west side of the city are required, with good railroad connections. The majority of Rochester manufacturers do not take the report seriously.

The Gleason tool works is to receive an addition to the machine shop to cost $70,000. The building will be 160x335 feet, and will be constructed of concrete blocks and steel frame. A

second structure, 148x148 feet in dimension, will be erected presently to cost $26,000. It will be used as a storage house for metal materials.—G. B. E.

## ROME, N. Y.

APRIL 7, 1919.

There has been no material change in the metal industry situation in Rome during the past thirty days.

The average working week for those employed is forty hours. Orders for the ordinary run of production are being received by the various mills here, but mostly for restricted quantities. However, this is considered only natural, and in no sense has it dampened the optimism of the leading metal manufacturers of Rome. They are not of the faint heart type; they do not possess the least bit of fear that this country will develop into a national insane asylum—in other words a country of Bolshevists.

Business will return to normal—perhaps better than normal, they believe, in sixty or ninety days, and with it a universal contentment on the part of the people.

The metal manufacturers here were among the pioneers in instituting social service and welfare work among mill workers. Some years ago a large club house was erected and furnished from basement to roof with pleasure-giving equipment, including bowling alleys, pool tables, athletic paraphernalia and baths. An auditorium containing a stage is in almost constant use for moving picture attractions or home-talent theatrical productions. A baseball field with grandstand adjoins the club house, and each mill supports an enthusiastic ball team in the Rome Industrial Baseball League. All this is fostered by the department heads and mill owners, as are many other things that help to make life worth living for the employer and employe—such as banquets, Sunday outings, picnics, clambakes, etc. In short, the metal manufacturers of Rome want their employes to be happy and enjoy themselves, and to that end are doing everything within reason to attain the object of their desires.—M. J. D.

## CLEVELAND, OHIO

APRIL 7, 1919.

Turn of the month is expected to see marked changes in the metal industry, because marked changes are pending in other industries. Foremost among these changes, leaders in the commercial and industrial world of the Cleveland district believe, will be that in building construction. Upon the progress of this branch of activity, leaders here say, depends largely whether there will be a normal outlet for any materials and commodities used in peace time pursuits, and the metal industry itself will be vitally affected by this progress.

While it may seem a far cry from a reduction in price of building materials to the absorption into normal channels of output of the metal industry, there is a close relation between these two factors, as indicated by the activities in industry as a whole during the last thirty days. About the most significant instance may be mentioned that of common brick. According to one of the leading producers and distributors of this material, 50,000 brick were moving prior to March 1. On March 29 600,000 brick were moving into consuming channels. This is taken to mean that a large amount of factory, construction, long pending, is actually under way, and the effect of this influence upon the metal industry, in demand for parts and finished product to meet these manufacturing requirements, is now being felt.

Still another important factor for all industry here, and members of the trade in this industry are likely to be affected more than others, is the announcement at Washington relating to the release of several million dollars tied up in war contracts claims held by manufacturers in this district. Figures compiled in the offices of Munson Havens, secretary of the Cleveland Chamber of Commerce, show the amounts will total at least $3,000,000, According to Major J. H. Scobell, district production manager for the Ordnance Department, is of the opinion that the amounts may reach a total of $10,000,000. The money, as soon as

SAFETY FIRST! A MILL FLOOR SHOULD BE OF SUCH MATERIAL AS TO MAKE THIS SORT OF ACCIDENT IMPOSSIBLE.

properly released at the capital, can be used here for restoring those plants largely or entirely engaged in war work to peace time production, and it is believed by those familiar with this situation that a good deal of the funds will be diverted into financing new enterprises.

Another new automobile parts manufacturing concern for Cleveland also is in the making. The Cahan Products Company has purchased the property of the Western Machine Products Company on the east side of town. Operations at this property will begin at an early date, according to officials of the Cahan Products Company. During the war the plant of the Western Machine Products Company, was used to produce parts for the Rolls-Royce Automobile Company, for use in airplane construction. Officers of the Cahan Products Company are: President, F. S. Shields; vice president, L. H. Mesker; secretary, L. M. Lucius; treasurer, A. W. Lieke.

Preparations for a large motor car parts concern, to supply a similar enterprise already in operation, are nearing completion. The Walker Motor Company, the third new automobile parts company to acquire land in this district in the month, has taken over 90,000 square feet adjacent to the easterly edge of the city, including buildings. A new structure, to cost approximately $200,000, four stories high, with about 100,000 square feet of floor space, will be built. Here the assembling and sales departments for the H. J. Walker Company, manufacturers of motor parts for passenger automobiles, trucks and tractors, will be established. It is stated by officials of these concerns that about 1,200 men will be employed at the new plant at the beginning of operations. Leaders in the new enterprise are officers of the H. J. Walker Company. H. J. Walker is president, and Norman Walker secretary-treasurer.

A new nickel plating plant for Cleveland is announced this week in the acquisition by the Pierce Plating Corporation, New York City, of property from the K. D. Carburetor Company here. New process of nickel plating for Cleveland will be introduced at an early date, it is said. J. N. Pierce, president, and E. Ekedahl, secretary-treasurer of the Pierce interests, will establish their headquarters in Cleveland. At a later date the Pierce interests propose to erect their own plant here.

Still another influence of the increased activity in automobile production which will reflect to the advantage of the metal industry, is seen in the plans of the newly organized Jones Gear Company, with a capitalization of $800,000, for large production of transmissions, differential gears, cut gears and clutches. Property aggregating eleven acres has been acquired east of the city, and the first unit in a group of buildings will soon be under construction. Officers of the new company are: President and general manager, Frank Jones, formerly of the Warner Gear Company and the Muncie Gear Works; vice president, R. L. Queisser, of the R. L. Queisser Company, Cleveland; treasurer, A. R. Callow, of the Callow-Kirby Company, this city.

Production of airplanes for practical commercial and passenger service will henceforth be the principal activity at the Glen L. Martin Company, according to Mr. Martin himself. First of these will be four passenger planes, for use between New York City and Los Angeles, carrying 12 passengers each. First flights are expected to be made August 1. Plans for a night shift, to meet the requirements, are being completed at the Martin plant here. Wesley A. Hill, New York City, is said to be back of the project for trans-continental air service.

Using the same tactics employed to arouse the best in all through patriotic appeal, the Chamber of Commerce Committee has urged the adoption of a flag, similar to that of the starred service flags, to indicate the number of soldiers re-employed in plants. First to adopt this plan is the American Multigraph Company. It uses, however, the original service flag. For each returned soldier re-employed, a star is ringed, and new stars will be ringed as fast as the lads come back. The plan was originated by Tom Wright, manager of industrial relations of the plant. The only stars that cannot be encircled are the gold ones.

Leaders in the metal and allied industries agree that this or some similar plan makes it difficult for any firm to refuse to take soldiers back. Such is the belief of E. C. Henn, of the National Acme Manufacturing Company; W. H. Staring, vice-president of the Peerless Motor Car Company; J. D. Cox, president of the Cleveland Twist Drill Company; Sheldon Cary, president of the Browning Company, and many others. These and many other firms have been taking their soldiers back right along and have adopted plans for making that fact known, plans not unlike that of the American Multigraph.

Members of the chamber committee that is largely responsible for this movement are: Edgar E. Adams, general superintendent Cleveland Hardware Company; Charles L. Bradley, vice-president Union Commerce National Bank; H. B. Bole, vice-president Hydraulic Pressed Steel Company; E. R. Grasselli, first vice-president Grasselli Chemical Company; E. C. Henn, vice-president National Acme Manufacturing Company; Eric C. Hopgood, managing editor THE PLAIN DEALER; Alex Printz, president Printz-Biederman Company; Col. D. H. Pond, chairman civilian relief committee, American Red Cross; Warren S. Stone, chief of Brotherhood of Locomotive Engineers. This committee is now continuing its survey of employment conditions, with a view toward lessening unemployment to the minimum.—C. C. C.

## MONTREAL, CANADA

APRIL 7, 1919.

Business conditions in the metal industry in Montreal have been very quiet during the past month and a great number of price reductions have gone into effect on general lines of brass goods. Lower prices are now in full force on copper products and it is felt that about April something definite will be done regarding a new schedule of prices. Even though reductions may be made in copper and brass products they will not be noticed to any great extent in manufactured brass goods just at present. In a great many lines of manufactured brass goods the cost of labor and finishing is the big item to be taken into consideration. Stocks in the hands of jobbers and retailers are low and buying is being done on a conservative basis.

Scrap metal dealers have little to do these days and their chief occupation is battering down the prices at which they will consider buying material. One of the large scrap metal dealers stated that during the past week they did not make a single sale, the first time this has happened in thirty years business experience.

It appears that the future depends largely on the action of the United States and Canadian Governments in dealing with the large surplus of copper and brass scrap left over from the war work shops. There are some millions of tons of this material in store and if it is released the market will be thoroughly glutted.

The Canada Metal Company, Limited, has removed its new factory from Beman and Dalhousie streets to Park avenue. The company manufactures a full line of lead pipe, sheet leads, babbitt and solder.—P. W. B.

## CINCINNATI, OHIO

APRIL, 7, 1919.

The recovery of business among the leading factors in the metal industry hereabouts is slow, but it is fairly steady and certain. In other words, orders are not yet numerous, but inquiries are sufficiently extensive to indicate that the users of machinery and all else that calls for the employment of the various metals are beginning to display interest in life again. As a matter of fact, the machine-tool manufacturers in the Cincinnati district are far from pessimistic over the situation, and declare it to be their belief, on the whole, that before many more weeks have passed there will be a revival in business which will give them at least something like a normal peace volume of orders. They hardly expect anything resembling the enormous volume of business which was brought by the war, realizing that it would be next to impossible for even the most extensive industrial activity during peace times to duplicate the high-speed, under-pressure call for equipment resulting from the desperate needs of nations at war. So far, there has not been any great foreign demand for machinery, and indications vary, as do opinions on the subject of how much export trade there is going to be. Some manufacturers report rather

numerous calls from abroad, indicating an interest in modern equipment which they believe will spell big business later on; while others state that the inquiries they have received are negligible, and do not look for much in the future. It is, of course, true that in France and England there have been vast quantities of machinery imported from the United States for use in munition factories, and that these machines may be used industrially, thus shutting off to some extent business which might otherwise have developed.

The R. K. LeBlond Machine Tool Company, in a statement published recently, discussed the possibilities of foreign business, and stated that the present high freight rates constitute one of the most serious obstacles to export trade. The company stated that apparently there would be ample financial machinery provided for export business by American banks, and that in parts of Europe, as well as the rest of the world, there would probably be a fair demand for machinery.

The annual dinner and business session of the Cincinnati Branch of the National Metal Trades Club was held at the Business Men's Club on the evening of March 6, with James Schermerhorn, editor and publisher of the Detroit "Times," as the guest of honor and principal speaker. Mr. Schermerhorn spoke on "This Side of Over There," under which title he discussed the business outlook in view of the end of the war and the present situation in Europe. He drew a parallel between present conditions and the Napoleonic invasions of a hundred years ago. Referring to the general situation, he said: "Fair and settled conditions are not going to come quickly. The universe has had a terrible malady and convalescence is likely to be a tedious process. You cannot build an early and lasting revival of production and trade upon the wreckage of billions of dollars, gone out of commercial existence in smoke and gas. Labor, indispensable in winning the war, is entitled to a larger share of the blessings of the democracy it has helped to sustain than it has heretofore enjoyed; capital, confronted with many great perplexities and unusual burdens, is entitled to labor's good understanding and co-operation in this reconstruction period. In their ability to put themselves in each other's place, in the spirit of interdependence, rests the hope that we shall escape the upheavals that have followed in the wake of autocracy's overthrow in Europe." Other speakers included F. C. Caldwell, treasurer of the National Metal Trades Association; Lieutenant R. G. Manson, of the French Army, and Major B. L. Baldwin, of the Engineers. The following officers were elected for 1919: President, J. B. Doan, of the American Tool Works Company; vice president, W. T. Emmes, Boye & Emmes Machine Tool Company; treasurer, H. W. Kreuzberg, Champion Tool Works; secretary, J. W. Carrel, Lodge & Shipley Machine Tool Company; executive committee, R. T. Hazelton, Cincinnati Milling Machine Company; Henry Ritter, Lunkenheimer Company, and Neil C. Lamont, Worthington Pump and Machinery Corporation.

K. C. C.

## COLUMBUS, OHIO

April 7, 1919.

The metal market in Columbus and central Ohio territory has been rather quiet during the past month. There is no great demand for any metals and consumers are following the policy of buying from hand to mouth as it were. Users are loath to accumulate stocks under the circumstances. The tone of the market is not very good although metal users and dealers believe that better things are in store for the future.

Brass and copper are both quiet and prices rule uncertain. Aluminum is about the same although there is a slightly better demand for that metal. Tin and zinc are both rather quiet. The best feature is the demand for type metals which continues quite good. There is a considerable movement in all type metals.

Stocks in this territory are not large. Metal using concerns are using up their reserves and that is having the effect of reducing stocks to a rather low ebb. Manufacturing is slow in getting on a peace basis and consequently things are waiting and little buying for the future is reported.

The Meadville Metal Products Company, of Ashtabula, Ohio, has been chartered with a capital of $35,000 by Charles N. Crosby, R. R. Story, D. F. Dunlavy, T. P. Fitzgerald and Grace Hartman.

The authorized capital of the Monarch Brass Company, of Cleveland, has been reduced from $120,000 to $1,200.

An increase in the authorized capital of the Superior Brass Manufacturing Company, of Mansfield, Ohio, from $25,000 to $60,000 has been made.

The capitalization of the Elyria Enameled Products Company, of Elyria, O., has been increased from $150,000 to $500,000.

The Holan Metal Products Company, of Cleveland, has been incorporated with a capital of $50,000 by James Holan, H. D. Brainard, Frank J. Jirka, J. P. Kalina and William H. Hacker.

The E. R. Rose & P. Wrobbel Company, of Cleveland, has been chartered with a capital of $15,000 to deal in structural iron and bronze by E. R. Rose, P. Wrobbel, Mrs. E. R. Rose, Mrs. P. Wrobbel and C. G. Liebold.—J. W. L.

## DETROIT, MICH.

April, 7, 1919.

There is but little change in the metal industry field here from that of a month ago. However, the outlook for the future seems to be considerably improved. The automobile companies are operating heavier and heavier every day, and this has a tendency to make conditions brighter for the future in Detroit.

Practically all manufacturers in this particular line believe within the next few months there will be started one of the greatest revivals of business that has ever been known. There is a constant fight on to overcome war conditions, and it is believed the situation is well in hand.

The outlook for the automobile industry was never better than it is today, and most of the plants now are already beginning to speed up. The fact that Henry Ford has announced the possibility of a cheaper car of his own individual manufacture is causing much speculation in the automobile field here in Detroit and in outside territories too for that matter.

Two or three of the Ford Company's most famous executives and efficiency men have recently resigned. They have gone about it in a quiet way and make no definite announcement as to their future. It is believed, however, they have left the old company with a certain object in view, but what that object is no one seems to be in a position to say. The future will only show what Mr. Ford and his associates have in view.

Mr. Ford is quoted as saying, however, that when he does start making his new car the plant will be located near the old home town—and that means Detroit.

The Detroit Valve and Fittings Company has recently purchased from the city of Wyandotte, a suburb of Detroit, one whole block on which it is reported the company plans to erect a new plant. The price of the land was $25,000. This same property was originally given to the company by Wyandotte about ten years ago as an inducement for the company to build their plant in that city. It is said that the property when first taken over by the company was never used for the purpose intended and finally reverted to the city again. The Detroit Valve and Fittings Company now plans large extensions, and so decided to buy the property outright.

It is reported plans have been completed by Menominee, Mich., architects for an addition to the Aerial Cutlery Company plant at East Marinette, in the upper part of the state. This addition will make the Aerial Cutlery Company plant one of the largest of the kind in the middle west.—F. J. H.

## TRENTON, N. J.

April 7, 1919.

Trenton metal manufacturers are very anxious for business conditions to become readjusted so that their plants can be operated on the same basis as before the war. While material is getting more plentiful the prices do not take enough drop to

aid business conditions improving, and this has caused a slump in building. New buildings of course always add to the business of metal manufacturers and until a change comes no great activity along the metal line is looked for. One manufacturer declared that he hardly had enough orders on hand to keep all the old employes at work, but was trying to find something for them to do unless business became better.

Although the war is ended the Kenilworth plant of the American Can Company will continue making shells. A contract with the United States Government for 1,000,000 shells and a contract for a like number for the British Government will keep the plant going full force for a considerable time. No additions will be made to the working force. The plant is one of the few engaged in making ammunition in New Jersey at the present time and during the war employed nearly 1,500 hands.

The plant of the American Standard Metal Products Corporation at Paulsboro, N. J., scheduled to cease operations, as contracts for war munitions have been cancelled, is still in operation and it has been announced that there will not be any further suspension.

Empire Metal and Refining Company, Newark, N. J., contemplates making extensive improvements. The company is now occupying the former plant of the Newark Bay Smelting and Refining Company on Plum Point lane. Plans are also being prepared in New York for the enlargement of the plant with the erection of a number of buildings. The Empire company was recently incorporated in New Jersey by a number of New York men. Carl H. Wolf is chairman of the board of directors and general manager of the plant.

Atlantic Metal Novelty Works, of Newark, N. J., has been incorporated with $25,000 capital to manufacture and deal in metal goods. David Joseph and Sarah Joseph, of Newark, and Harry Joseph, of Newark, are the named incorporators.

The Cameron Iron & Bronze Company, with an office at 41 Paterson street, New Brunswick, N. J., has been incorporated with $30,000 capital to manufacture iron and bronze castings, fences, fixtures and various goods of that sort. The incorporators are Margaret A. Harkins, Helen C. Barnwell, of Highland Park, and William P. Danberry, of New Brunswick.

Harry C. Schick, Inc., 99-105 Chestnut street, Newark, N. J., has been incorporated with $125,000 capital to manufacture novelties of gold, silver and other metals. The incorporators are Harry C. Schick and Adela M. Schick, of Irvington, and James E. Wordley and Nellie V. Wordley, of East Orange.

The Colonial Stamping Company, Inc., has been incorporated with $50,000 capital to deal in metal goods. The incorporators are Robert Badentrop, A. J. Schulz and H. M. Castle, all of Newark.

The De Roy Company, of 12 West Park street, Newark, N. J., has been incorporated with $25,000 capital to make and deal in jewelry. The incorporators are John J. Schafer, of Newark, and Abe E. DeRoy, and Gertrude M. DeRoy, of Caldwell.

An honor medal, the gift of the State of New Jersey for each of her sons in the army and navy, as well as similar recognition for the women of the state who devoted themselves to war service, will undoubtedly be made by the New Jersey Legislature. About 140,000 men enrolled from New Jersey. The medals will be of bronze.

The Trenton Emblem Company, which was organized some time ago by Willard M. Hammond and Frederick A. Barton, is now operating a successful plant on East Franklin street. The company manufactures bronze, red metal, brass and aluminum castings and also gives special attention to bronze mixtures.—C. A. L.

## VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

**The R. Wallace & Sons Manufacturing Company,** Wallingford, Conn., manufacturers of silverware, has arranged for the erection of a new two-story brick building on Quinnipiac street, Wallingford, Conn.

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**The Maryland Smelting & Refining Company,** West Church street, Hagerstown, Md., has arranged for the construction of a new metal concentrating plant, with electrical and other equipment; a one-ton brass melting furnace will be installed. It is proposed to establish a capacity of about 20 tons a day of brass and aluminum ingots.

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Men employees in the general offices of the **New Jersey Zinc Company,** New York, participated in a "Let's Get Acquainted" dinner at the Yale Club, New York City, on Wednesday evening, March 19. It was the first function of its kind in the history of that corporation.

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**The U. S. Copper Products Corporation,** Cleveland, Ohio, has placed an order with the General Electric Company, Schenectady, N. Y., for a brass melting furnace of the muffled arc type with a capacity of 2,200 pounds per hour. The U. S. Copper Products Corporation reports that it expects to have its plant completed about the first of May, when it will manufacture copper and brass tubing.

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Fire destroyed the interior of the factory of the **Niagara Falls Metal Stamping Company,** Tenth street and Angelo Court, Niagara Falls, N. Y., on March 7, with a loss of $75,000. E. E. Fowler, general manager of the company, reports that the plant is now in shape and that they are able to give the usual prompt service to all orders. The company operates stamping, galvanizing, plating, polishing, japanning and lacquering departments.

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**The B. Hoffmann Manufacturing Company,** 257 Sixth street, Milwaukee, Wis., manufacturers of steamfitters' and plumbers' materials, pipe, and brass castings, will build a three-story shop, 40 x 100 feet, of brick, concrete and heavy mill construction, to replace the one destroyed by fire several weeks ago. The company operates a bronze foundry, brass machining shop, tool and grinding room, casting shop, plating and polishing departments.

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F. A. Bennett and E. E. Seeley have formed a partnership under the firm name of **Bennett & Seeley,** with offices at 315 Court Exchange Building, Bridgeport, Conn., and will handle a complete line of foundry and electro platers' supplies. Mr. Seeley has followed this business locally for some years, while Mr. Bennett is equally well known as the secretary of the Bridgeport Manufacturers' Association, and will continue actively to fill that office.

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**The American Metal Products Company,** manufacturers of aluminum bronze bearing metal and special acid-resisting bronze, Milwaukee, Wis., has appointed the following district sales managers: Pittsburgh territory, J. S. Morrison, Oliver Building, Pittsburgh, Pa.; Cleveland territory, Fred J. Michels, Cleveland, Ohio; Chicago territory, G. B. Perlstein, Chicago, Ill.; Detroit territory, Charles Kenyon, Penobscot Building, Detroit, Mich.; and New York territory, J. Kronman, 29 Broadway, New York.

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**The Electric Furnace Company,** Alliance, Ohio, has taken an order for electric furnace equipment to be shipped to Mexico for melting brass. The furnaces will be of the tilting type, rate at 105 kw. electrical capacity, 1,500 pounds hearth capacity and with a melting rate of 600 pounds per hour. The Electric Furnace Company now has under construction ten Baily electric brass furnaces at its Salem, Ohio, plant. A complete description of the Baily electric furnace appeared in THE METAL INDUSTRY for September, 1917.

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**The New Standard Hardware Works,** of Mount Joy, Penn., manufacturers of a new process for the hot tinning and retinning of all kinds of metals, has closed another contract for a No. 2 unit which will be installed at Sturges & Burns Manufacturing Company plant at Chicago, Ill. During the past two months plants were installed and completed at the Buhl Stamping Company, Detroit, Mich., and also the Na-

tional Enameling & Stamping Company, of Milwaukee, Wis. Both units are used for hot tinning steel stampings for milk cans.

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**Herman A. Holz,** metallurgical engineer and manufacturer of metallurgical and magnetic testing apparatus, has moved his office and laboratories to the Pullman Building, 17 Madison avenue, New York City, occupying the entire third floor.

The laboratories will contain the most up-to-date equipment for experimental heat treating, hardness and impact testing, micro and macro-photographic investigation of metal sections, apparatus for magnetic measurements and for investigating the mechanical properties of metal products by determination of their correlated magnetic characteristics, also equipment for X-ray work on metal products.

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**The Mueller Metals Company,** Port Huron, Mich., has reconverted its plant to a peace basis. The company is now at work on orders for brass rods, brass and copper, tubing, brass forgings, die castings, aluminum forgings and white metal die castings, as well as brass and steel screw machine products. The company also makes a specialty of die castings in brass, bronze and aluminum. Mechanical equipment is being installed for the manufacture of crankshafts and other automobile parts. Among the departments operated are brass, bronze and aluminum foundry, brass machine shop, tool and grinding room, casting shop, rolling mill and plating department.

## BLISS COMPANY EARNINGS

The report of the **E. W. Bliss Company,** Brooklyn, N. Y., for the year ended December 31, 1918, issued recently, showed net earnings after the deduction of taxes and depreciation, amounting to $1,271,353, which was equal after preferred dividends to $46.85 a share earned on the common stock. This compared with $89.57 earned on the same stock in the preceding year. Common dividends amounting to $593,750 were paid in the course of the year, as compared with $625,000 on the same stock in 1917, and surplus decreased from $1,614,295 to $577,603. Total surplus as of December 31, 1918, was $16,131,878, as compared with $15,336,134 in the preceding year.

## CHANGE IN FIRM NAME

**The Metals Plating Company,** 511 Fifth avenue, New York, a New Jersey corporation with a factory at Elizabeth, N. J., has filed notice of change of name to the Copper Plate Sheet & Tube Company, and has also increased its capital from $300,000 to $1,000,000. The company at present manufactures copper plated steel sheets and will later on manufacture copper plated steel tubes.

## REMOVAL

**The Jewelers Technical Advice Company,** manufacturers of blow torches and other equipment for jewelry and metal shops have moved their New York office to 5 Cortland street.

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**The Enterprise Electroplating and Manufacturing Company** has moved its plant from 90 Woodbury avenue to 169-173 Fort street, East, Detroit, Mich.

## INCORPORATIONS

**Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.**

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**To manufacture wire novelties.**—The Grand Rapids Wire Products Company, Grand Rapids, Mich. Capital $10,000. Incorporators: Peter D. Pearce, John H. Haven and others.

**The Central Stamping & Metal Spinning Company,** Dayton, Ohio, has been incorporated with $10,000 capital stock by James F. McBarron and others. The company operates a spinning, stamping, soldering and polishing departments.

## INCREASE IN CAPITAL STOCK

**The Marine Equipment Company,** Wilmington, near Los Angeles, Calif., manufacturers of hardware, etc., has increased its capital from $10,000 to $50,000. The company operates a brass machine shop.

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**The Bridgeport Hardware Manufacturing Corporation,** Bridgeport, Conn., has increased its capital by $175,000 or to a total of $275,000. The company operates a tool and grinding room, stamping, plating, polishing and japanning departments.

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**The Corona Typewriter Company,** 129 West 42nd street, New York, with a plant at Groton, N. Y., has increased its capital from $1,500,000 to $2,000,000. The company operates a tool room, and plating, polishing and japanning departments.

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**The Superior Brass Manufacturing Company,** Mansfield, Ohio, has increased its capital stock from $35,000 to $60,000. It will enlarge its plant at an early date and install a few new special machines. The company operates a bronze and aluminum foundry, brass machine shop, tool and grinding room and stamping, tinning, polishing and plating departments.

## PRINTED MATTER

**Carboy Rocker.**—The Jiffy steel carboy rocker is illustrated and described in a small folder just issued by the Hanson & Van Winkle Company, manufacturers of electro-platers' supplies, Newark, N. J.

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**Metal and Thermit.**—The Metal and Thermit Corporation, New York, has issued a large calendar containing a map which shows the new railroad time zones in the United States which went into effect January 1, 1919. This calendar and map may be had free by corresponding with the above company at 120 Broadway.

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**Grits and Grinds** is the name of a little journal published by the Norton Company, of Worcester, Mass., in the interest of Norton products such as Crystolon and Alundum. The February issue contains an interesting article on the "Polishing of Cast Iron by Rumbling," by R. M. Johnson. The article is illustrated by means of photographs of rumbling barrels which were reproduced from the January issue of THE METAL INDUSTRY.

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**Concentrating Tables.**—The Deister Concentrator Company, Fort Wayne, Ind., has issued Bulletin No. 3, which is descriptive of the Deister Overstrom diagonal deck types of concentrators. These concentrators are adapted for and being used in increasing numbers by foundries and casting shops for the wet treatment of furnace ashes for the recovery of the metal contents. One of the great advantages claimed for the Deister table is that due to its shape it offers most efficient area for the work that it is designed to do.

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**Foundry Information.**—The New Era Manufacturing Company, Inc., of Kalamazoo, Mich., have just issued a catalog containing over one hundred and fifty (150) brass foundry formulas covering the following subjects: Acid resisting bronze, aluminum bronze, aluminum casting alloys, babbitt metal, bell metal, brass, composition bronze, die casting alloys, gun metal mixtures, manganese mixtures, nickel alloys, phosphor anti-friction bronze, phosphor bronze and tin bronze. The New Era Manufacturing Company will be pleased to mail a copy of the catalog to proprietors, superintendents and foremen of foundries, upon request.

**Powdered Fuel.**—The Quigley Furnace Specialties Company, Inc., 26 Cortlandt street, New York, has issued Bulletin No. 11, which is devoted to Quigley powdered fuel system for preparing, distributing and burning powdered fuel. The bulletin contains a number of plans and specifications for powdered fuel transport systems for delivering fuel in the powdered and concentrated condition to the various furnace units. One of the interesting features of this bulletin is a reproduction of a table prepared by the Quigley Company, which shows comparative B. T. Us. secured for one cent at various prices for fuel oil, natural gas, producer gas, hand fired coal and powdered coal.

## CATALOG EXHIBIT

**An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.**

## METAL STOCKS MARKET QUOTATIONS

New York, April 7, 1919.

| | Par. | Bid. | Asked. |
|---|---|---|---|
| Aluminum Company of America | $100 | $500 | $575 |
| American Brass | 100 | 206 | 210 |
| American Hardware Corp | 100 | 135 | 138 |
| Bristol Brass | 25 | 24 | 26 |
| International Silver, com | 100 | 25 | 35 |
| International Silver, pfd | 100 | 87 | 91 |
| New Jersey Zinc | 100 | 238 | 241 |
| Rome Brass & Copper | 100 | 290 | 330 |
| Scovill Mfg. Co | 100 | 335 | 350 |
| Yale & Towne Mfg. Co | ... | 210 | 220 |

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## METAL MARKET REVIEW

Written for The Metal Industry by W. T. Partridge.

April 7, 1919.

### COPPER.

Improved sentiment in the copper industry during March was evident in all branches of the trade. The result was an upward tendency in prices of from ½ to ¾c per pound despite heavy stocks known to exist here and abroad. Sales are estimated to have been approximately 20 per cent greater than in February and aggregated 75 million pounds. The business transacted was largely on domestic account for prompt and April shipment. While export business was small in volume, there remained some unsatisfied demands in England which were held up because of the sensational drop in sterling exchange. Electrolytic copper was in greatest demand and difficult, at the close, to obtain at 15.25c while some producing interests were asking 15.50c per pound. Lake copper under light demand recovered to 15.75c from 15.50c while casting copper was also very quiet, but firm in an advance of ¼c to 15c on the last day. Approval by the War Department was announced late in the month, on an agreement with copper producers by which Government owned stocks of 100 million pounds will be disposed of through the United Metal Selling Company appointed by producing interests as their representative. Sales of Government stocks, according to the agreement, equal to 10 per cent of sales made on their own account by producers, must be accomplished each month during the next ten, after which time, sales of at least 10 million pounds monthly for Government account must be made to dispose of the entire amount in the fifteen months time limit agreed upon.

Auction trading in copper was resumed on the New York Metal Exchange March 31, after many months. Selling agents who heretofore have been inimical to such transactions are now heartily in favor of developing the business. April sales have been made at 15½c., and much higher prices, 15⅝ to 16c., have been bid for May to August shipment.

The committee representing the Copper Export Association, which has been investigating conditions in Europe since January, returned home March 30, in an optimistic mood, predicting large consumption of copper in Europe in the near future as a result of the ambitious plans entertained by Great Britain, France and Italy for electrifying railways and building electric power stations. Much metal also will be needed for the manufacture of ocean cables.

### TIN.

While the tin situation in March continued to be held under Government restriction as to importations and the price—72.50c per pound—at which Straits metal could be bought, some progress, at least was made. An interesting development was the announcement made by the chief of tin control that a substantial refund from the fixed price was probable, in the event of allocations to consumers being promptly accepted at the usual rate of consumption. To aid in the more speedy adjustment to more nearly normal conditions in the market, it was understood that producers of American tin made from Bolivian concentrates had been asked to withdraw as sellers of pig tin from the market. In compliance with this request quotations on American pure tin on March 28, were advanced to 72c, there being no offerings on that day of 99 per cent American. Previously during March, American pure tin had been offered and sold at from 68c for pure, 66c for 99 per cent tin, at the beginning of the month, at gradually advancing figures which on March 25, were 69c for pure and 68c for 99 per cent tin.

### LEAD.

The official base prices of the American Smelting & Refining Company were maintained unchanged throughout March at 5.00c East St. Louis, 5.25c New York. In the outside market, the February closing, 5.15c East St. Louis, 5.35c New York was unchanged during the first week of the month, but with a cessation in demand there was a gradual decline to the level of the largest interest by March 12, in prices of metal Metal suffered further from the unbroken dullness, and on March 24 was down to 4.87½c East St. Louis, 5.20c New York. A few days later, the market was cleaned up of cheap lots, and in the absence of such offerings a recovery was made to the basis of the leading producer, 5.00c East St. Louis, 5.25c New York. Until general business improves, the lead trade does not expect to make large sales.

### SPELTER.

The spelter market continued to mark time in March awaiting improvement and readjustment in other industries requiring the metal. Production of spelter, in the opinion of some critics in the trade should be reduced to something more nearly approximating pre-war output, whereas it has been maintained on a scale not much below that of 1918. The disposition of Government owned stocks, which are mainly of the higher grades, was expected to be decided upon early in April. These stocks amount to between 40,000 and 50,000 tons. Prices opened at February closing, 6.27½c East St. Louis, 6.62½ New York, with ores $40-$45 per ton. The market being stagnant during the first ten days, prices declined to 6.15c East St. Louis, 6.50c New York, ores going down to $40-$45. Some business in future positions was developed in the third week at these prices, but prompt and early shipments continued neglected. Ores declined a little later to $37.50-$41.50 per ton, but metal recovered to 6.20c East St. Louis, 6.55c New York in the last few days.

### ALUMINUM.

The aluminum market in March, following a period of dullness, declined from February closing, 31-32c for No. 1 virgin to 29-31 March 10; other grades being unchanged. Early in the second fortnight, apprehension as to expected foreign competition caused a further recession to the lowest prices of the month; 27-29c for No. 1 virgin, 26-28c for 98-99 per cent remelted, 22-24c for No. 12 remelted. In the last week, after the pressure of offerings from United States and Italian Governments had been relieved there was a recovery to 29-30c for No. 1 virgin, but other grades were unchanged at 26-28c for 98-99 per cent remelted and 22-24c for No. 12 remelted.

### ANTIMONY.

Demand for antimony in March was very light and prices steadily declined from 7.00-7.12½ for prompt wholesale, duty paid, at the beginning of the month to 6.50c at the close, when importers and dealers were bidding 6.25c for both prompt and futures, but without success. Spot jobbing lots were held at 6.62½-6.75c according to size. The weakness in prices was due partly to expectation that Government stocks, quantity unknown, might soon be in the market adding to the already heavy stocks carried.

### SILVER.

While the price of silver in this country remained unchanged at $1.01⅛ during March, this being the world price established in August, 1918, by international consent, the London market—established at 47¾d at the same time—was advanced on March 28 to 50d, the reason being the depreciation in the English pound sterling. The flow of silver from this country continued; the New York assay office having shipped $1,500,000 obtained from melted silver dollars while from the Philadelphia Mint $2,000,000 were shipped to India and these figures are not complete for the outgo.

### QUICKSILVER.

The market for quicksilver was extremely quiet with steadily declining prices in March—the total decline being $17 per flask of 75 lbs. each. After opening at $85, the February closing, each week brought lower offerings into the market in the hope of stimulating demand, the last offerings being made at $68 per flask. As pre-war prices from 1908 to 1914 ranged between $36 and $52 per flask, the outlook is for further declines before final adjustment is completed.

### PLATINUM.

The demand for platinum continued steady with prices unchanged at $100 per troy ounce. The total decline since the war ended has been but $5 per ounce, quotations having been stationary since Feb. 18.

### OLD METALS

Old metals in March were quiet, but during the last week a stronger tone was developed. While many inquiries were received from consumers not much business resulted, sellers being not so eager to dispose of holdings as they were early in the month. The coppers after declining at the beginning, recovered ¼c per lb. before the close, when strictly crucible sold at 13c; light copper at 10.25c and uncrucibled wire at 11.75c. Brass clippings after losing ½c recovered to 8.50c. Old scrap zinc and electrotype after declining ½c recovered ¼c to 4.25c each per lb. Old cast aluminum which opened at a decline of 1.00c to 15c recovered to 17c per lb. Old sheet aluminum after a decline of 1.00c to 17c remained unchanged while new aluminum was steady at 21c throughout the month.

## WATERBURY AVERAGE

Lake Copper Average for 1918, 24.75. 1919—January, 23.00. February, 18.00. March, 15.50.

Brass Mill Spelter. Average for 1918, 9.858. 1919—January, 9.00. February, 8.20. March, 8.00.

## MARCH MOVEMENTS IN METALS

| | Highest. | Lowest. | Average. |
|---|---|---|---|
| Copper: | | | |
| Lake | 16.00 | 15.25 | 15.476 |
| Electrolytic | 15.50 | 14.75 | 15.012 |
| Casting | 15.25 | 14.62½ | 14.821 |
| Tin | 72.00 | 71.50 | 71.75 |
| Lead | 5.35 | 5.20 | 5.263 |
| Spelter (brass special) | 6.40 | 6.20 | 6.289 |
| Antimony | 7.12½ | 6.50 | 6.836 |
| Aluminum | 31.50 | 28.00 | 29.809 |
| Quicksilver (per flask) | $80.00 | $68.00 | $72.333 |
| Silver (cts. per oz.) | 101⅛ | 101⅛ | 101⅛ |

## INQUIRIES AND OPPORTUNITIES

**Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. page.**

# Metal Prices, April 7, 1919

## NEW METALS

| | Cents. |
|---|---|
| COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum. | |
| Electrolytic, carload lots | 15½ |
| Lake, carload lots | 16 |
| Casting, carload lots | 15¼ |
| TIN—Duty Free. | |
| Straits or Australian, carload lots | 72½ |
| LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots | 5.25 |
| SPELTER.—Duty 15%. | |
| Brass Special ..... nominal | 6¾ |
| Prime Western, carload lots | 6.62½ |
| ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb. | |
| Small lots, f. o. b. factory | .... |
| 100-lb. f. o. b. factory | .... |
| Ton lots, f. o. b. factory | 30.33 |

| | |
|---|---|
| ANTIMONY—Duty 10%. | |
| Cookson's, Hallet's or American ..... | Nominal |
| Chinese, Japanese, Wah Chang WCC, brand spot | 6.67½ |
| NICKEL—Duty Ingot, 10%. Sheet, strip and wire, 20% ad valorem. | |
| Ingot | 40c. |
| Shot | 43c. |
| ELECTROLYTIC | 45c. |
| MANGANESE METAL ..... | Nominal |
| MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots) | $1.90 |
| BISMUTH—Duty free ..... nominal | $3.50 |
| CADMIUM—Duty free ..... nominal | $1.45 |
| CHROMIUM METAL—Duty free ..... nominal | |
| COBALT—97% pure | $3.00 |
| QUICKSILVER—Duty 10% per flask of 75 pounds | $68.00 |
| PLATINUM—Duty free, per ounce | $100.00 |
| SILVER—Government assay—Duty free, per ounce | $1.01⅛ |
| GOLD—Duty free, per ounce | $20.67 |